First Great Western

READING TURBO MAINTENANCE DEPOT

CLASS 165/166 TURBO

CONSTRUCTION
&
COUPLERS

First 165 103

165/166 CONSTRUCTION
&
COUPLERS.

CLASS 165

CONSTRUCTION &

COUPLERS

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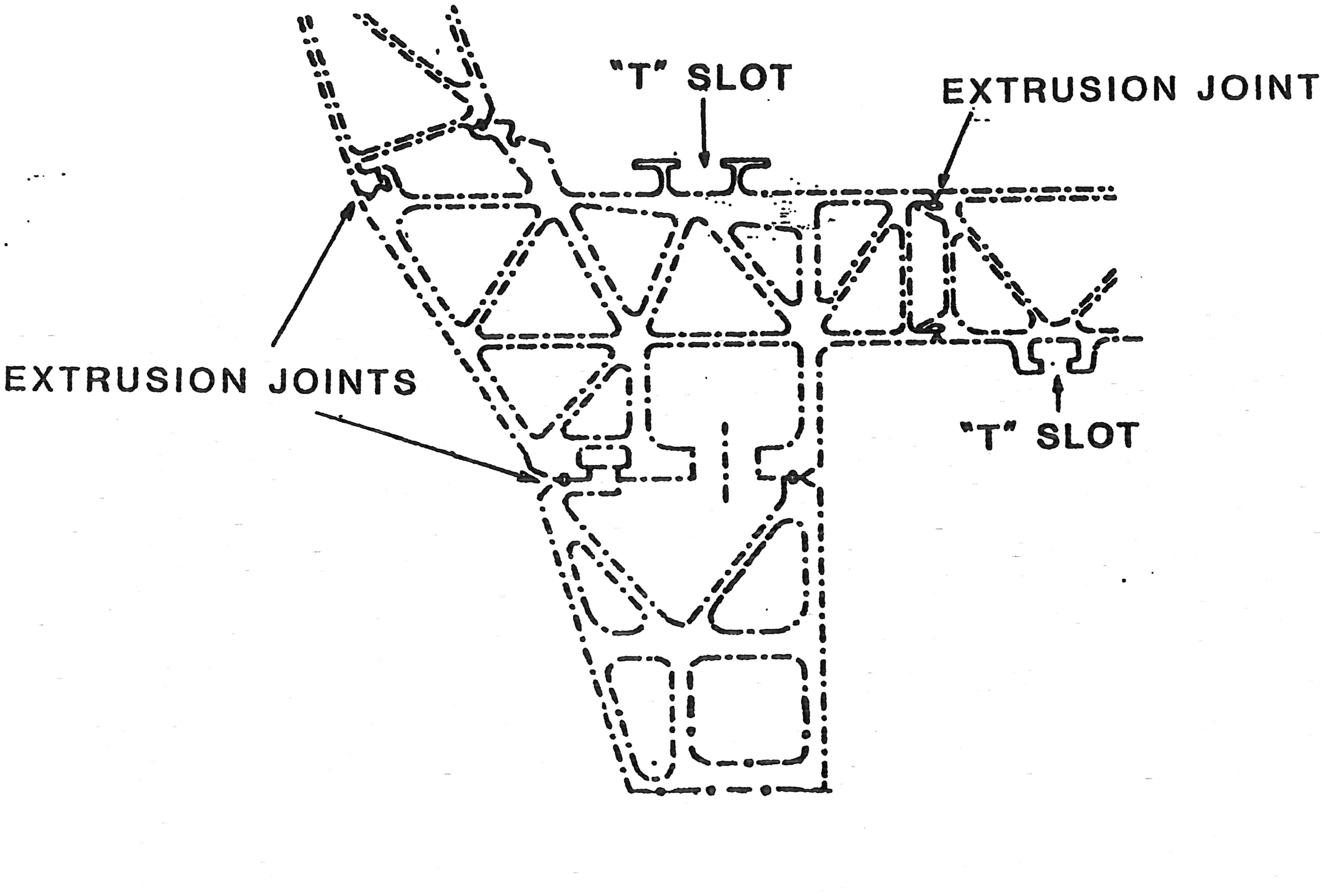
CONSTRUCTION

Each vehicle body is constructed from aluminium extrusions to form a "monocoque" structure comprising underframe, bodysides, bodyends and roof. The structure is supported by the bogies at the underframe bolsters.

To give the bodyshell its strength, the number of "holes" in the structure have had to be kept to a minimum.

This is achieved by providing slotted "T" sections on the aluminium extrusions. These are used in conjunction with various types of "T" bolts and fixings to mount practically all equipment to the bodyshell, both inside and out.

EXAMPLE OF EXTRUDED SECTIONS



The following sections are constructed separately on jigs and then brought together in one large jig where they are fully welded together to form the strong "monocoque" shell. All welding is done using the synergic Metal Inert Gas (M.I.G.) process.

UNDERFRAME

The underframe comprises of a floor assembly, bolsters, longitudes, lifting points, headstocks and yaw damper mounting brackets. Headstocks are provided one at each end of the vehicle, through which the couplers pass.

The floor assembly consists of one centre, two inner two outer and two solebar sections, which incorporate an interface for the vehicle body sides. Additional strengthening is provided under each door aperture by means of solebar stiffeners. Two bolsters are attached to the underframe at the bogie centre line, to provide an interface with the bogie, via secondary air bags and centre pivots.

Included in the underframe arrangement are dropout boxes, and spaces to allow for routing of pipework, electric cabling etc, and mounting facilities for the vehicle flooring. Four yaw damper mounting brackets, two per side and four lifting/jacking point assemblies, two per side, are attached below the underframe, inboard of the bolster assemblies.

ROOF

The roof comprises of two inner, two outer, one slip joint, two upper contrail extrusions and transverse carlines. Additional strengthening is located above each door aperture by means of cantrail stiffeners.

BODYSIDES

The bodysides comprise, an upper solebar (incorporating an interface for the underframe) a waistrial, a lower cantrail, and cantrail slip joint (incorporating an interface for the roof), dead light and door pillar extrusions. Taper end panels and framework are fitted between the bodyside assembly and the bodyend assembly.

Initial construction of the bodysides is done in three sections because of the passenger door openings.

BODYENDS

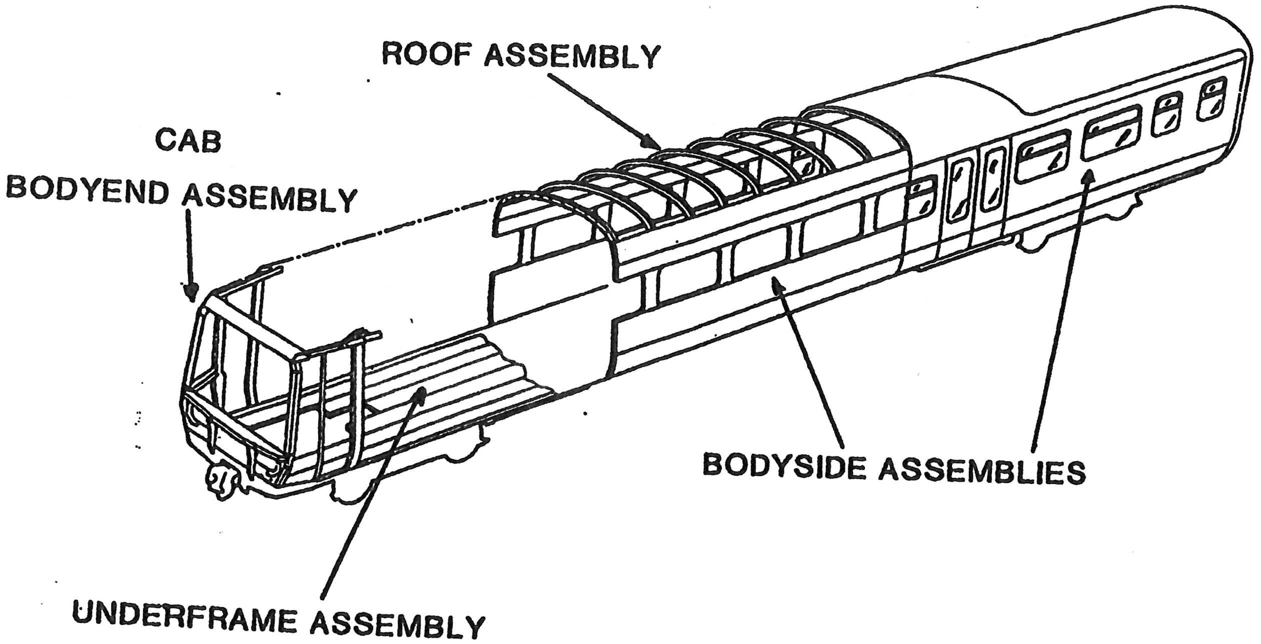
There are two types of bodyend structure:-

Intermediate End

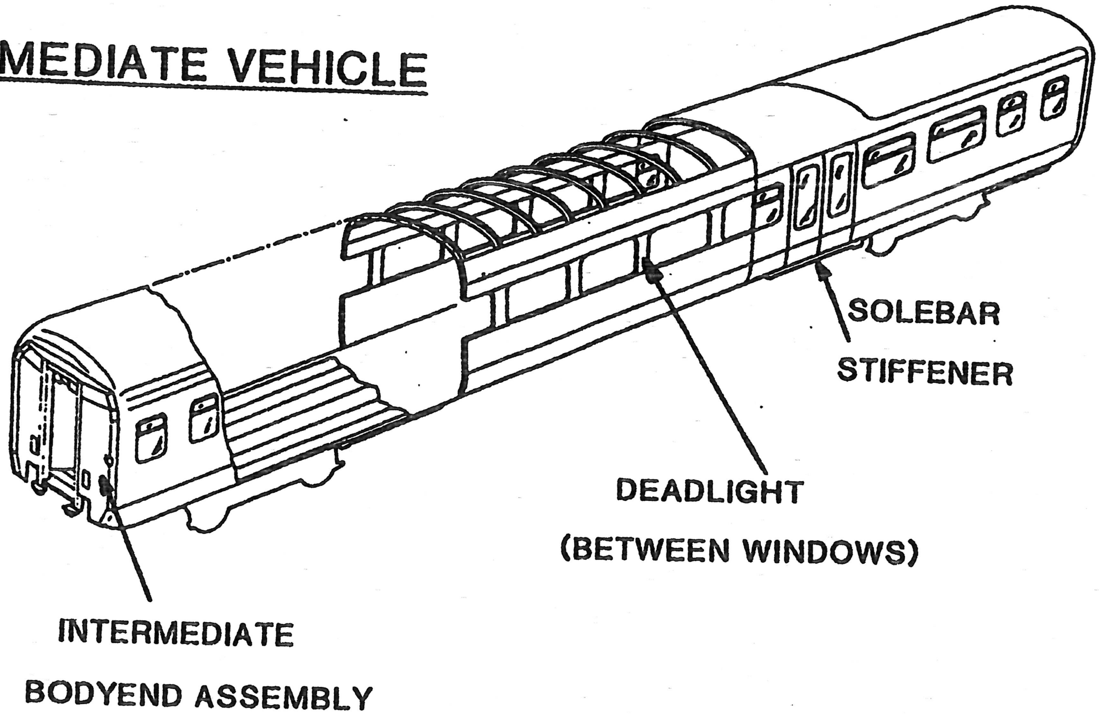
This bodyend is less critical than the cab end and is comprised of an extruded framework clad in aluminium panels with an aluminium canopy and interfacing for a face plate gangway.

BODYSHELL CONSTRUCTION

DRIVING VEHICLE


ROOF ASSEMBLY
CAB
BODYEND ASSEMBLY
BODYSIDE ASSEMBLIES
UNDERFRAME ASSEMBLY

INTERMEDIATE VEHICLE


SOLEBAR
STIFFENER
DEADLIGHT
(BETWEEN WINDOWS)
INTERMEDIATE
BODYEND ASSEMBLY

Cab End

The cab structure assembly consists of an extrusion framework, shear panels, missile protection plates and interfacing sections for the G.R.P. front shell. This structure in effect transmits buffing and collision end-loads into the "monocoque" shell.

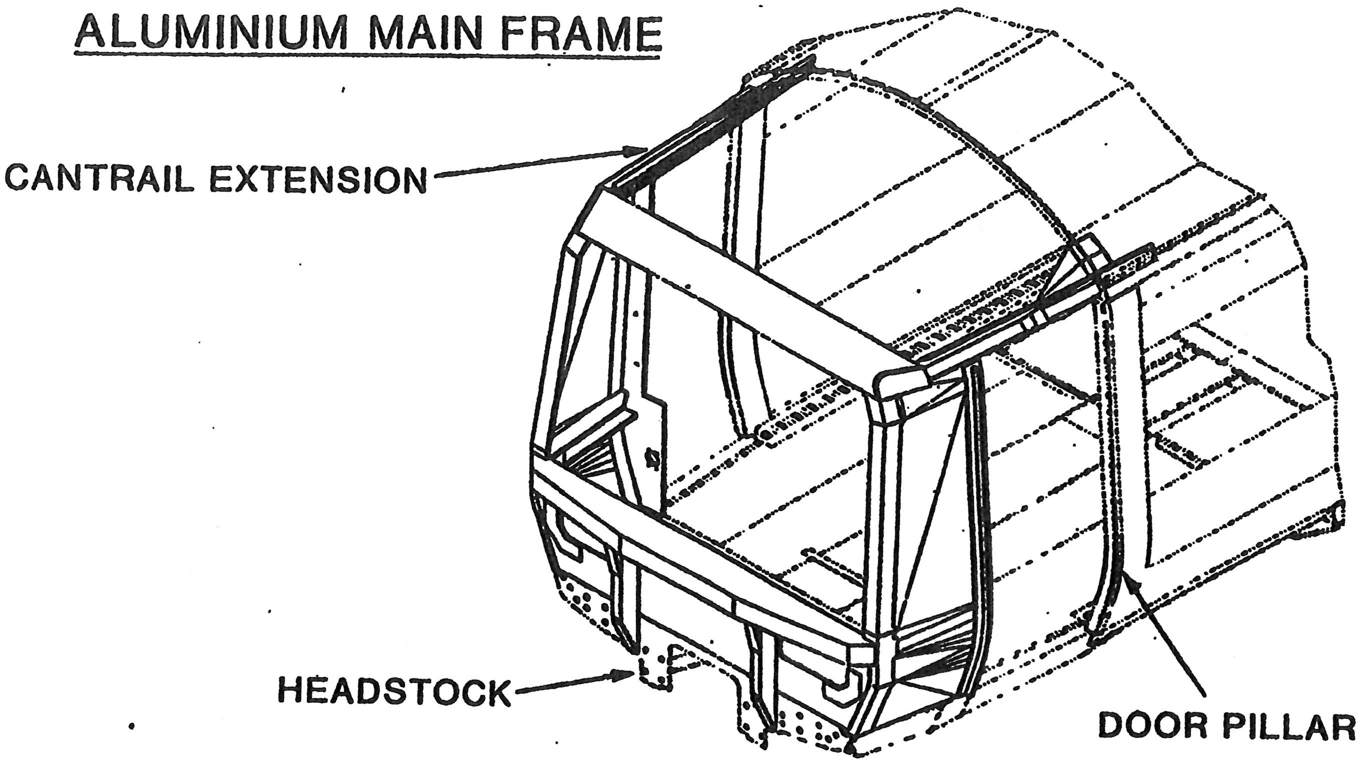
The cab G.R.P. shell is attached to the main aluminium bodyend using steel bolts and special fasteners.

All cab end equipment is attached to the GRP shell and not the aluminium frame.

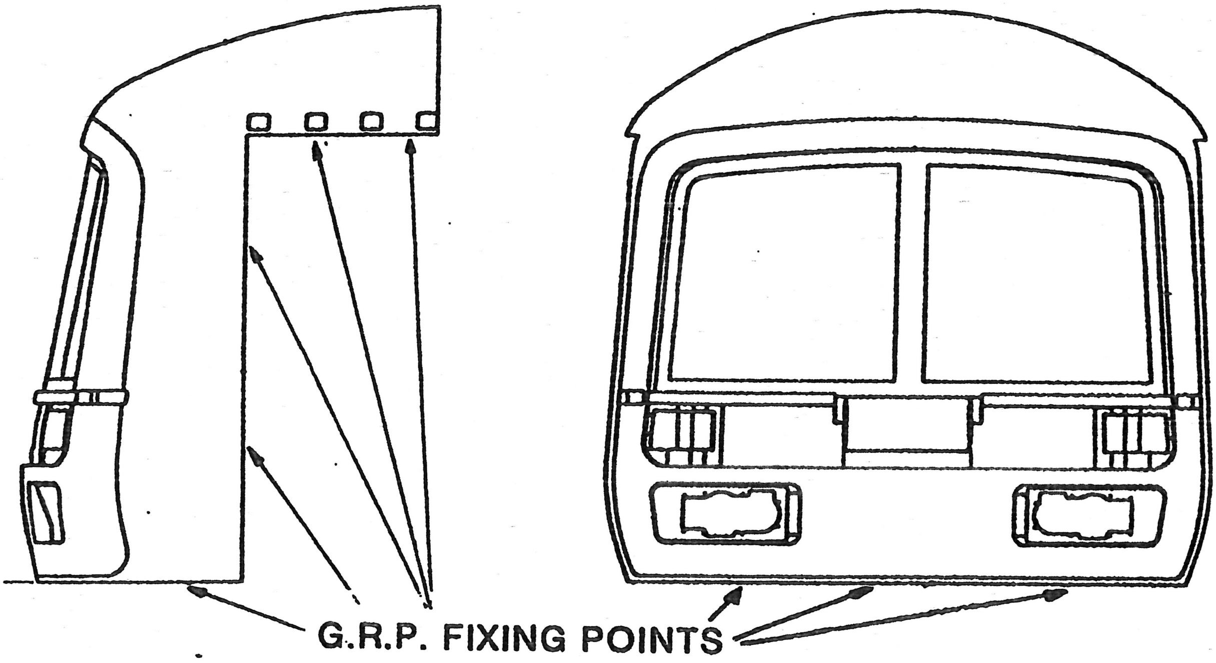
When the bodyshell construction is complete it is de-greased and abraded then painted using a special two-pack polyurethane paint system. The finished bodyshell is then fitted out.

CLASS 165 CAB CONSTRUCTION

ALUMINIUM MAIN FRAME


CANTRAIL EXTENSION
HEADSTOCK
DOOR PILLAR

CAB G.R.P. SHELL


G.R.P. FIXING POINTS

MAINTENANCE

The aluminium vehicle bodyshell strength is a direct result of its tubelike "monocoque" construction. Therefore it is important that it is treated with respect.

No alteration of any sort should be made to the structure of these vehicles.

No holes or slots should be made and no blanking plates or plugs removed. If extra equipment has to be fitted use of "T" slots etc. should be made.

Particular attention should be given to the following items:-

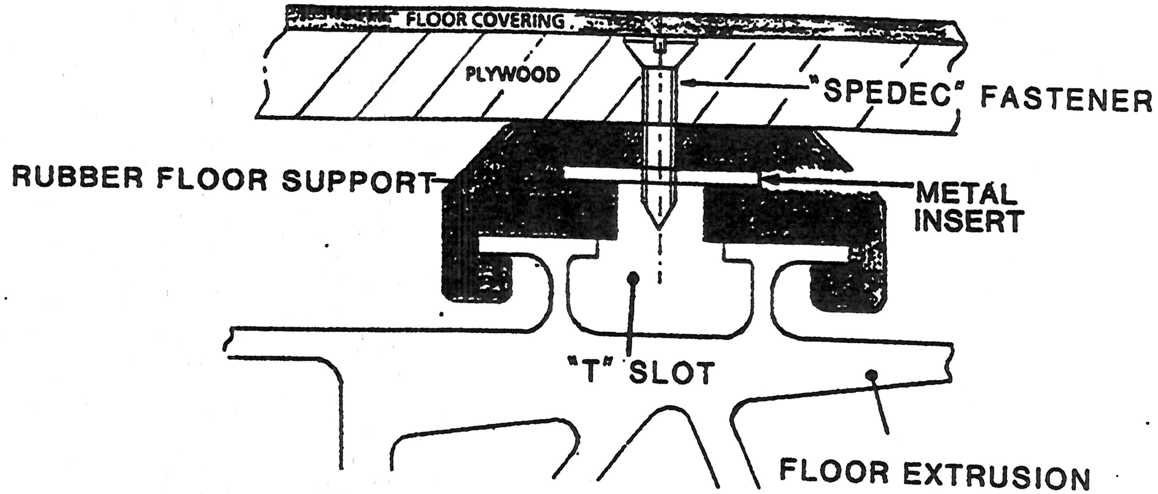
FIXINGS

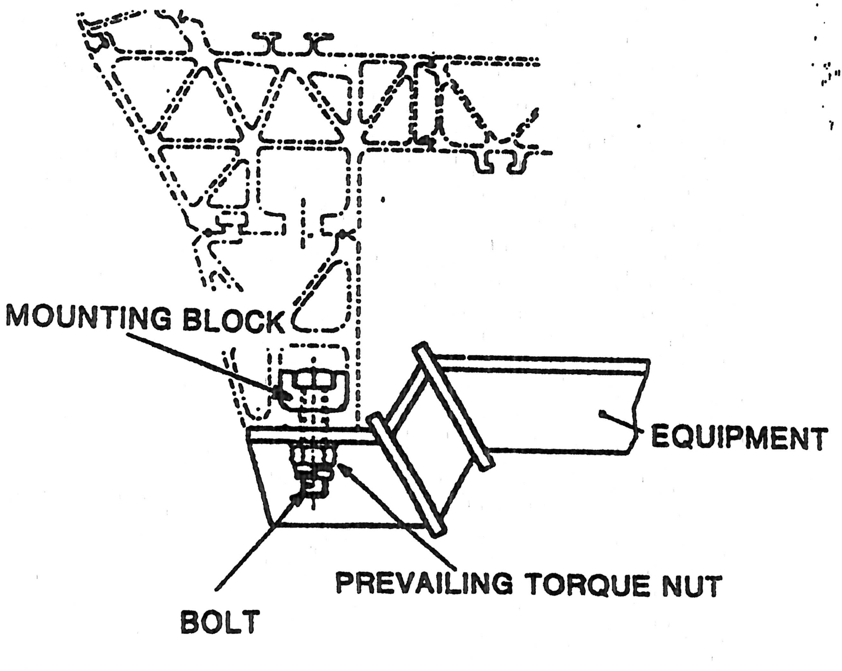
To enable the various different types of equipment to be accommodated in and around the bodyshell, a number of unique fixings methods have been devised. All of these methods take advantage of the many "T" slots provided on the various extruded sections.

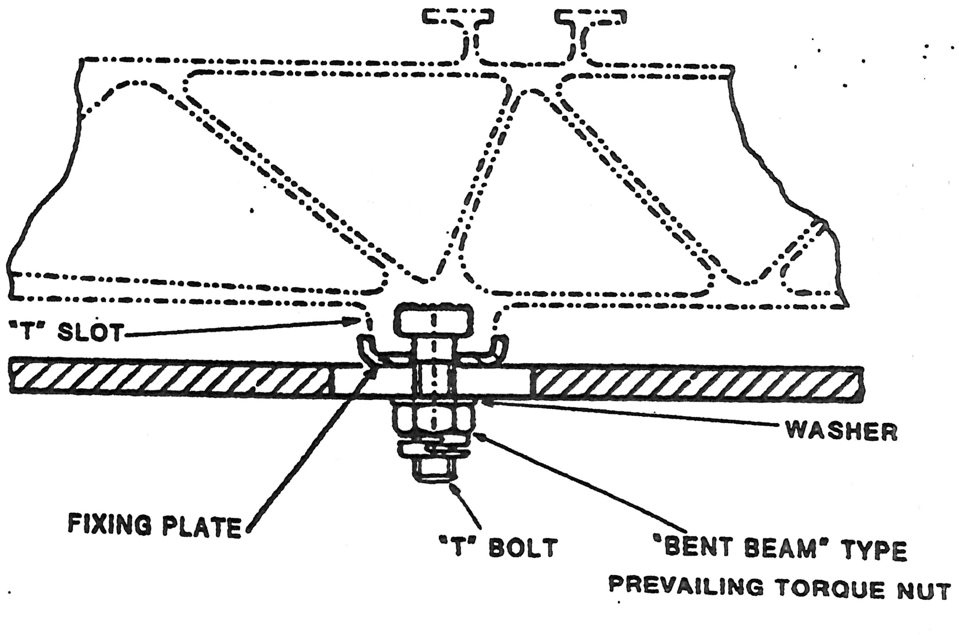
Where steel bolts or fixings come into contact with aluminium, the possibility of Bi-metalic corrosion exists. Therefore a special anti-corrosive paste MUST be used on these areas, and in addition the "T" bolts used MUST have a special "Zinc" coating on the unthreaded section. Fixing plates are fitted over the "T" slots to prevent the sides from spreading.

Several examples of fixing methods are shown opposite.

A SELECTION OF FIXINGS


FLOOR COVERING
PLYWOOD
"SPEDEC" FASTENER
RUBBER FLOOR SUPPORT
METAL INSERT
"T" SLOT
FLOOR EXTRUSION


MOUNTING BLOCK
EQUIPMENT
BOLT
PREVAILING TORQUE NUT


"T" SLOT
WASHER
FIXING PLATE
"T" BOLT
"BENT BEAM" TYPE PREVAILING TORQUE NUT

PAINT DAMAGE

All damaged paintwork should be repaired as soon as possible. It may also mean that the bodywork is damaged as well so close inspection should be given.

Any exposed aluminium is subject to corrosion after a period of time.

BODY DAMAGE

All body damage on this vehicle should be reported immediately however minor it may appear. Even the smallest hole could develop into several fractures over a period of years, and at worst could result in a severely weakened structure, requiring major attention.

At no time should do-it-yourself body repairs be attempted until the bodyshell manufacturer has been consulted.

Particular areas for concern are, all corner radii; particularly in door and window openings and any tearing of the outer skin.

HEAT DAMAGE

The aluminium extrusions used on this vehicle are correctly heat treated for their purpose, therefore any excessive heat applied to the vehicle bodyshell could cause permanent damage which again, may not show up for some time and which could render the vehicle bodyshell defective.

At no time should welding and cutting equipment be used without consultation with the manufacturers. Areas susceptible to excessive heat under normal operating conditions are protected, for example a heat shield is fitted above the diesel engine area.

Any vehicle that has had, or been close to, a fire of any sort has possibly sustained heat damage and should, again be examined by the manufacturers.

ANCILLARY ITEMS

DRAWGEAR ASSEMBLY

The B.S.I coupler transmits traction and braking forces to the bodyshell through the drawgear assembly which consists of a spring and tailpin arrangement.

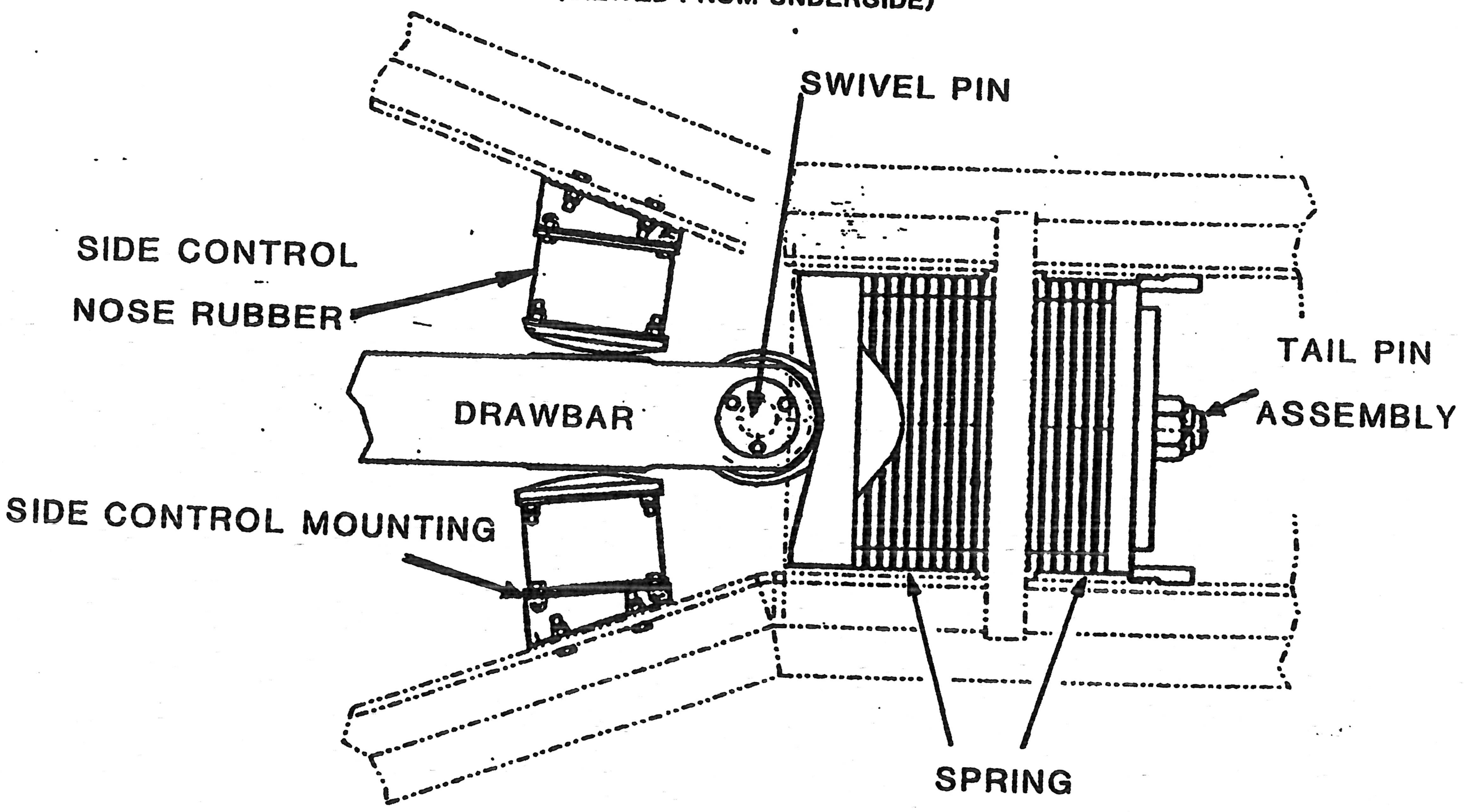
Side control rubbers are provided to cushion and limit the coupler sideways movement.

The coupler drawbar is attached to the tailpin via a swivel pin. This pin is retained in position by a retaining plate secured by the three "Verbus Rip" self locking bolts. A 10mm threaded hole is provided in the swivel pin for extracting it when required.

NOTE: The swivel pin can only be removed from underneath due to insufficient clearances above the drawbar.

DRAWGEAR ASSEMBLY

(VIEWED FROM UNDERSIDE)

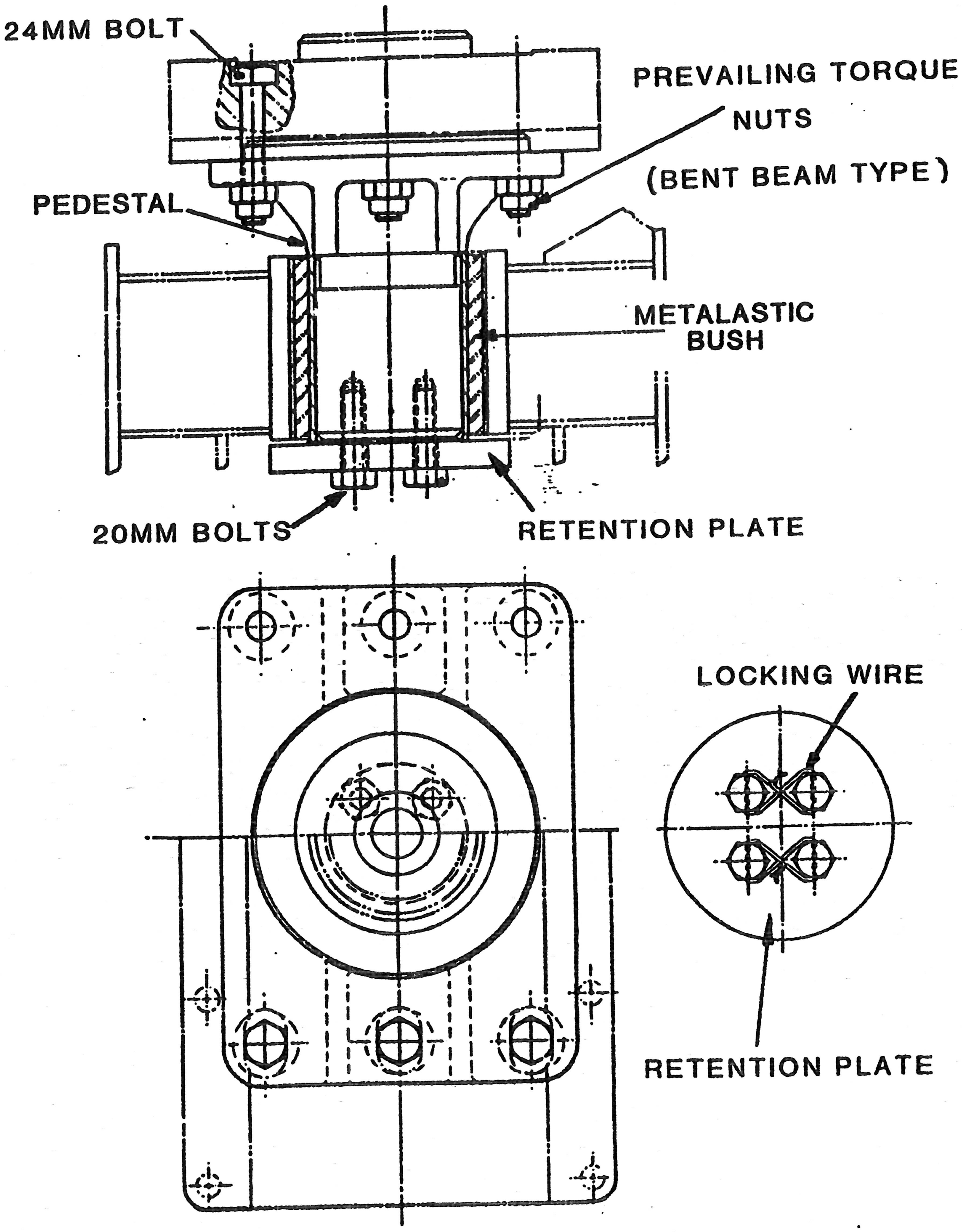

SWIVEL PIN
SIDE CONTROL
NOSE RUBBER
TAIL PIN
ASSEMBLY
DRAWBAR
SIDE CONTROL MOUNTING
SPRING

CENTRE PIVOT

Both bogies are secured to the underframe by a captive pivot pin. This will retain the bogie in position when lifting. If required one or both bogies may be separated from the underframe before lifting the vehicle.

The bogie rotates around a "metalastic" bush and the whole assembly is secured using a steel retention plate bolted through into the pedestal and protected with locking wires.

CENTRE PIVOT FIXING


24MM BOLT
PREVAILING TORQUE NUTS (BENT BEAM TYPE)
PEDESTAL
METALASTIC BUSH
20MM BOLTS
RETENTION PLATE
LOCKING WIRE
RETENTION PLATE

CAB SKIRT

A GRP two-piece skirt (valence) assembly is fitted to all driving vehicles.

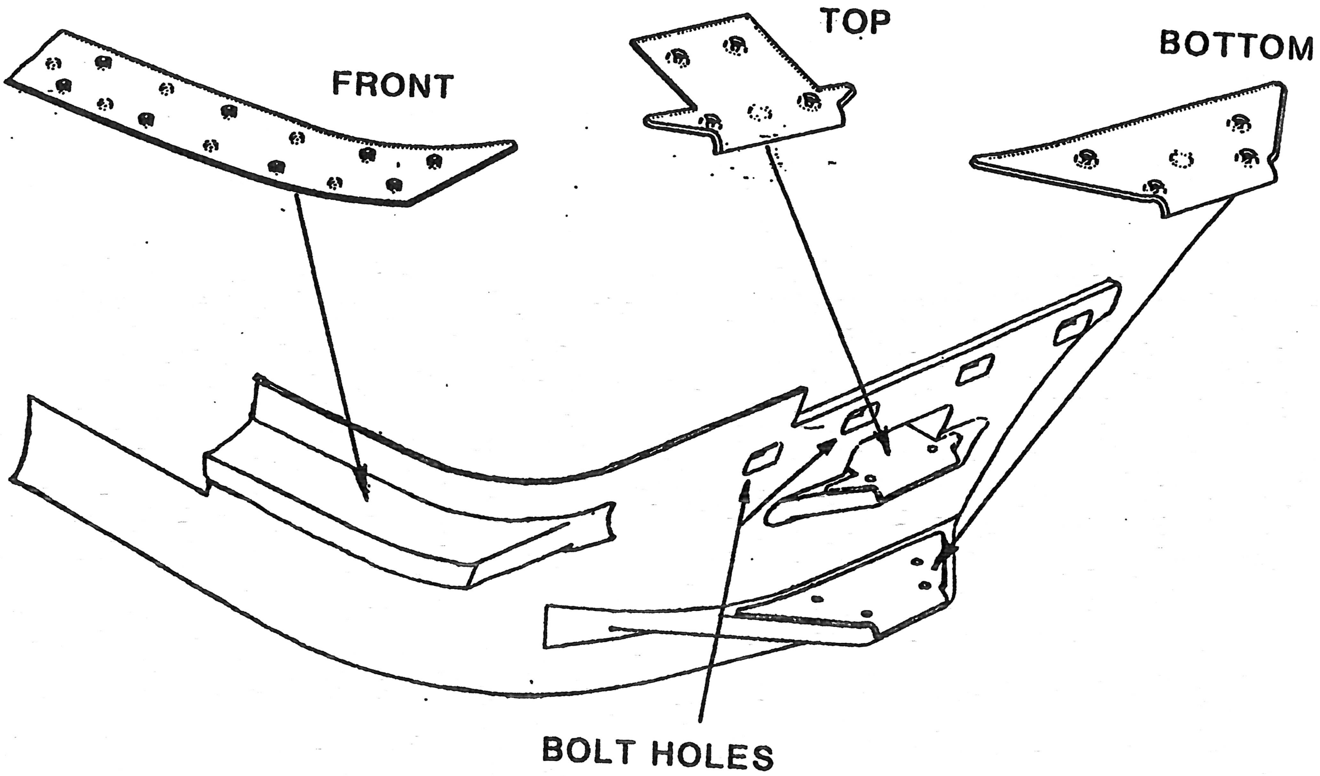
Each skirt section incorporates three steps, one at the front and two at the side for access to the drivers cab.

Metal treadplates are attached to each moulded step by steel screws. These are screwed through into a steel sub frame located behind each valance and supported from underframe "T" slots.

The two valence sections are attached together underneath the Auto-coupler by a bolt-through clamp plate assembly.

The valence sides are bolted into the aluminium framework by four bolts and the holes are sealed.

SKIRT AND TREADPLATE ASSEMBLY



GANGWAY END ASSEMBLY

Access between vehicles is provided by a gangway located at the non driving end of each vehicle.

Weather protection is provided by chloroprene rubber outer diaphragm. A chloroprene rubber seal is fitted around the inner side and top edges of the faceplate, to prevent draughts and the ingress of water between adjoining gangways.

The interior of the gangway is lined with decorative side and top cover panels and fitted with a commode handle and infra-red sensor to automatically open the doors.

The gangway is of the flexitor type employing six flexitor units in its construction, so that when the vehicles are coupled these units maintain the faceplates in contact while the vehicle is in motion. A flexitor unit consists of a rubber mounting which incorporates metal inserts to which the flexitor arms are attached. As movement between the vehicles take place the arms move causing the rubber mounting to flex; this flexing action maintain pressure between vehicle gangway faceplates. When the vehicles are uncoupled the Flexitor unit will automatically return to its free position.

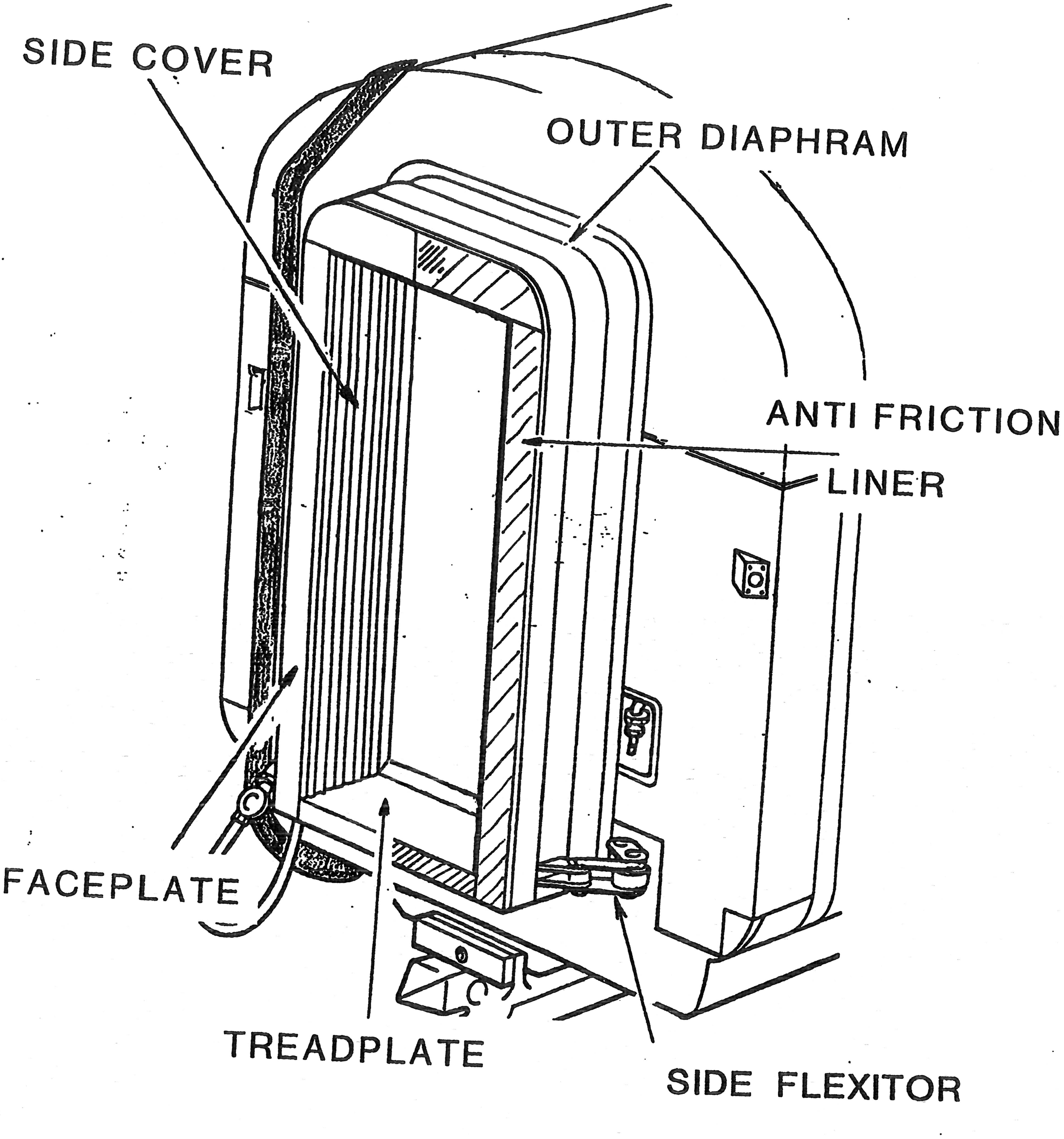
The lower part of the faceplate incorporates two flexitor units that are connected to a saddle on the automatic coupler, and by two flexitor units attached to the body end of the vehicle. The connection to the coupler moves the faceplate with the coupler as the vehicle negotiates a curve, and thereby minimises the sideways movement between faceplates of adjoining gangways under these conditions.

The top of the faceplate incorporates two flexitor units attached to the body end of the vehicle. These units are accompanied by a restraining link that prevents the top of the gangway from falling away from the body end, should there be a breakage of the flexitor unit.

The outer surface of the faceplate has non-metallic liners over one half of its surface area, to provide a wearing surface against the unlined half of the gangway faceplate on an adjoining vehicle.

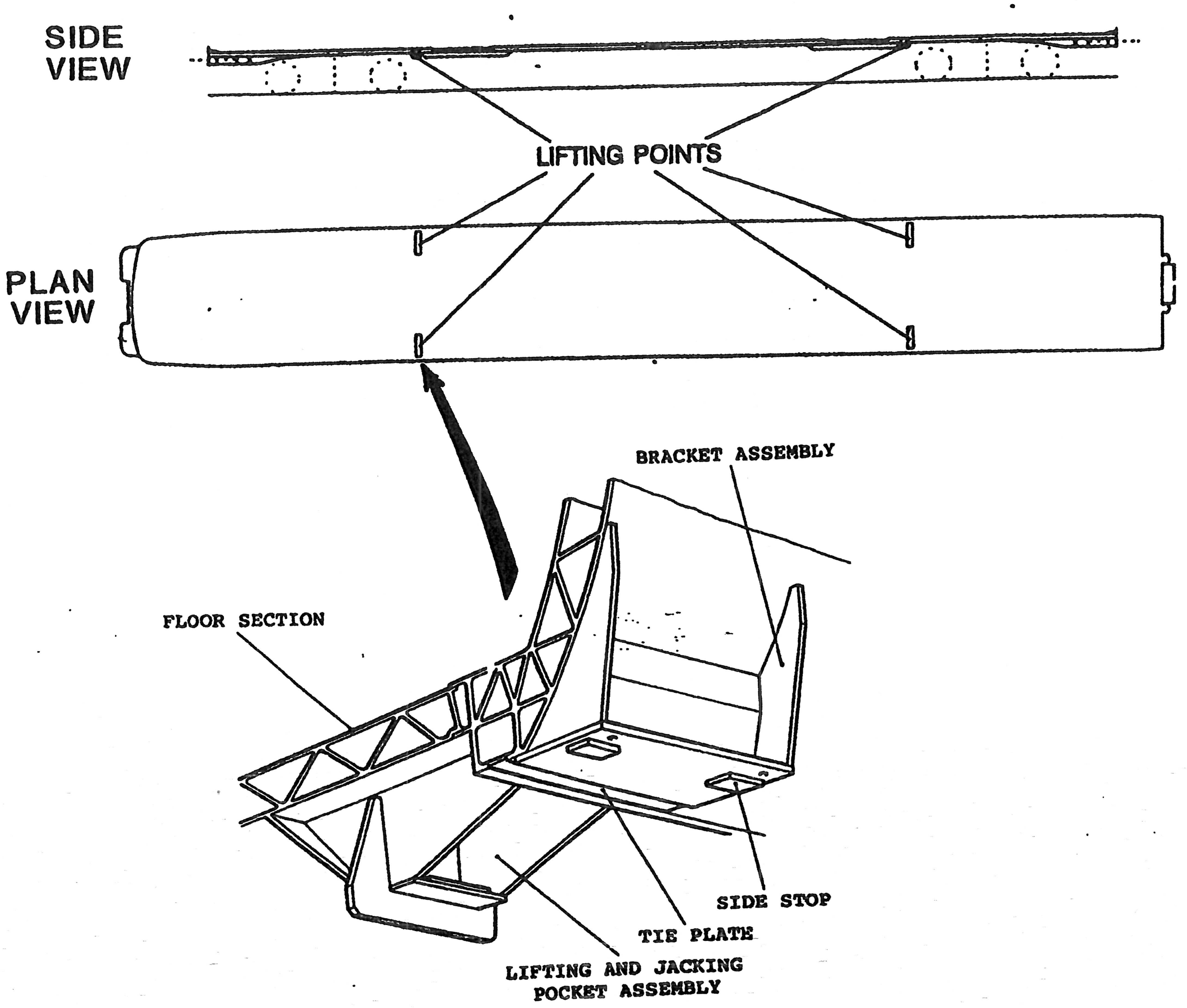
The upper surface of the base of the faceplate has non-metallic liners that provide a wearing surface against the underside of the treadplate. The treadplate, which is part of the body end structure, provides an interface between the vehicle static floor and the moving base of the gangway.

GANGWAY END


SIDE COVER
OUTER DIAPHRAM
ANTI FRICTION LINER
FACEPLATE
TREADPLATE
SIDE FLEXITOR

LIFTING AND JACKING

The vehicle is designed to withstand the conventional range of longitudinal loads, without permanent deformation. However, most portions of the underframe structure are not designed to withstand the vehicle weight, when lifting or jacking takes place. It is therefore essential that lifting or jacking is only attempted at the lifting and jacking points indicated.


SIDE VIEW
LIFTING POINTS
PLAN VIEW
BRACKET ASSEMBLY
FLOOR SECTION
SIDE STOP
TIE PLATE
LIFTING AND JACKING POCKET ASSEMBLY

LIFTING FACILITIES

The vehicle can be raised by any suitable lifting equipment capable of lifting more than the maximum vehicle tare weight.

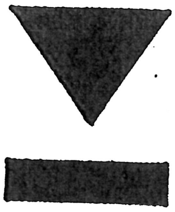
CAUTION: Derrick cranes must only be used in conjunction with a spreader beam having lifting centre of not less than 2.9m.

Four location pockets are provided on the underframe bolster, into which a lifting bracket/arm can be inserted. This facility is provided for use with derrick crane and spreader beam. These points are painted yellow for identification.

Jacking Facilities

The underside of the lifting points are used for standard jacking applications.

All authorised jacking points will be marked with the following yellow symbols:-



Lifting or Jacking with Bogies attached

Both bogies are secured to the underframe by a captive pivot pin; this pin will retain the bogies when lifting. Likewise the primary dampers will safely hold the wheel sets in position on the bogie.

When a vehicle is to be re-railed or jacked it may be found that the stroke of the jack is insufficient to lift the bogies clear of the rails. If this is the case the axlebox arm can be chained in position near the damper. Alternatively the primary damper can be removed and replaced by a bolt.

Estimated Tare Weights

a)	DMOCL	(with fuel and toilet water tanks full and bogies attached)	38.5 Tonnes
b)	DMOS	(with fuel tank full and bogies attached)	38.333 Tonnes
c)	DMOCL	(with bogies removed)	32.450 Tonnes
d)	DMOS	(with bogies removed)	32.933 Tonnes
e)	Bogie Unit	(P3-17 Power)	6.05 Tonnes
f)	Bogie unit	(T3-17 Trailer)	5.40 Tonnes

GLAZING

The glazing units fitted to the external of the vehicle are divided into those located at the following areas:-

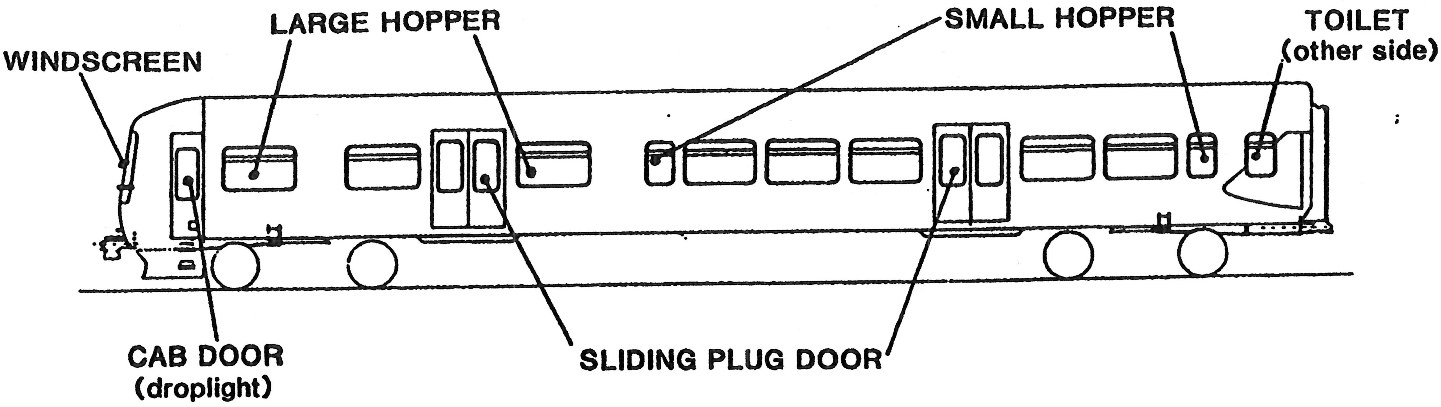
a) Cab (windscreens and doors)

b) Bodyside (including windows of slide plug doors)

c) Toilet

d) Gangway (fire barrier)

EXTERNAL WINDOW ARRANGEMENT (D.M.O.C.L.)



Several different types of glazing units are fitted to Class 165 vehicles as follows:-

CAB WINDSCREENS

The main cab windscreens are high impact resistant, double glazed units. The lower section is single glazed polycarbonate. The central sight area of each windscreen is heated by means of integral electrical elements.

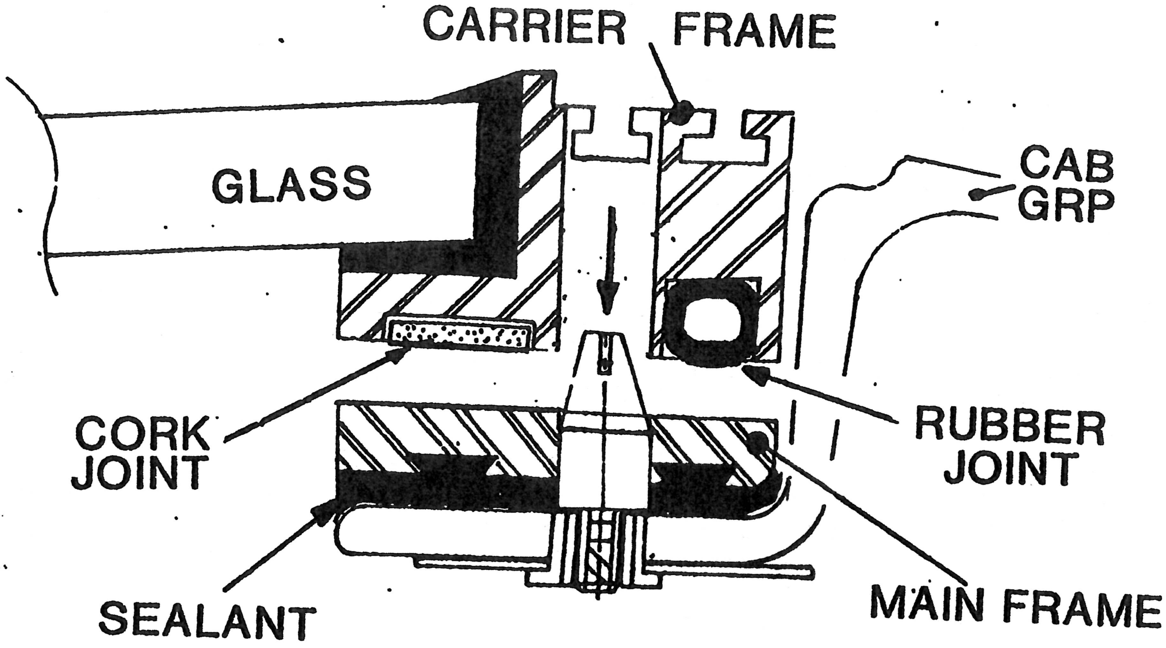
The non-drivers side windscreen upper section is opaque, except for a transparent section for the destination indicator. The lower polycarbonate section forms a cover for the windscreen wiper motor linkage, together with hinged outer panels giving access to the windscreen washer bottle filler.

Each windscreen glass is located in the cab front panel GRP by means of a split aluminium frame and secured by socket head screws, nuts and spring washers. Sealant is used to prevent water ingress between the main frame and cab front panel. The windscreen is bonded to a carrier frame which in turn is bolted to the main frame. Seals are provided between the main frame and the carrier frame to provide a watertight assembly. The carrier frame glass-to-frame and frame-to-panel joints are covered by flexible trim which is pushed into the carrier frame.

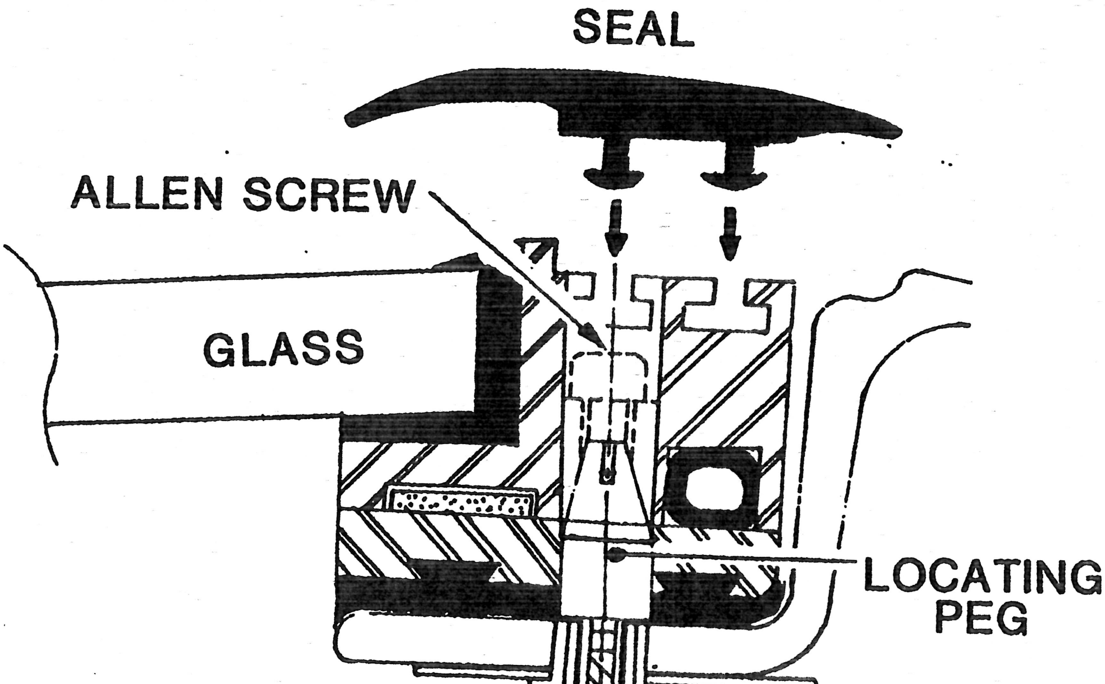
The approximate weight of each screen is 100KG. In practice the main frame will stay bonded to the G.R.P. cab windscreen. Removal will take place by separation of the carrier frame from the main frame (see illustration).

CAB WINDSCREEN ASSEMBLY

STAGE 1


CARRIER FRAME
GLASS
CAB GRP
CORK JOINT
RUBBER JOINT
SEALANT
MAIN FRAME

STAGE 2


SEAL
ALLEN SCREW
GLASS
LOCATING PEG

CAB DOOR DROPLIGHT

The doors are fitted with a droplight which incorporates a lower fixing glazing panel and an upper sliding panel. Both panels are of single glazed tinted toughened glass.

SALOON BODYSIDE - HOPPER WINDOWS (Large and Small)

The saloon bodyside windows comprise hopper units (large and small) fitted to the body structure and the glazing units fitted to the swing plug doors.

The bodyside windows are fixed to the vehicle bodyside from the interior and are positively retained by "T" bolts and nuts fitted through slots in the window outerframe. These are hidden by the interior window pan trim panel.

The glass panes are retained within the aluminium extruded frames by means of extruded rubber seals which engage in grooves located in the aluminium profiles. The opening vents are located within the main frame by the interior locking hinge arrangements and retained by means of a locking handle at the top. With the opening vents in the closed position an extruded rubber seal attached to the main frame restricts air flow through the window assembly.

The window pan trims are retained by a rubber strip at the top, hook and eye (velcro) strips down each side and a locating "lip" at the bottom. This allows easy removal by "peeling down the trim from the top.

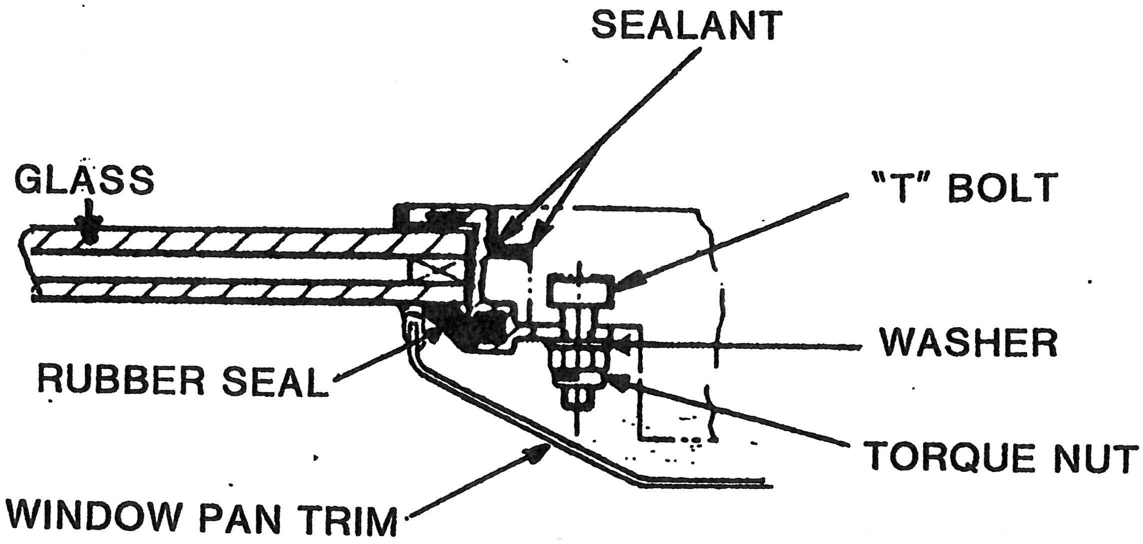
The maintainability aspects of this design are:-

a) The fixed glass can be replaced from inside the saloon without the need to remove any seat units, within a time scale of 1.1/2 to 2 hours.

   The glass can be removed and replaced by dismantling the rubber glazing section leaving the aluminium frame attached to the vehicle structure.

b) The hopper unit can be replaced by removing the side quadrants, cross rail cover time and releasing the retaining springs, leaving the aluminium frame attached to the vehicle structure.

BODYSIDE WINDOW FIXING ARRANGEMENT



Sliding plug door fixed glazing unit

Each sliding plug door glass is retained with a rubber extruded seal. Fitting of the glass is achieved from the inside with a 2 - 3 mm piece of wire inserted in the outer lip to |"pull" it into position around the door frame.

Toilet window

Opaque toilet windows are fixed to the vehicle bodyside from the interior and are positively retained by "T" bolts and nuts fixed through slots in the window outer frame.

The glass panels are retained within the aluminium frames by means of extruded rubber seals which engage in grooves located in the aluminium profiles. The extruded rubber profiles also provide a weather proof seal.

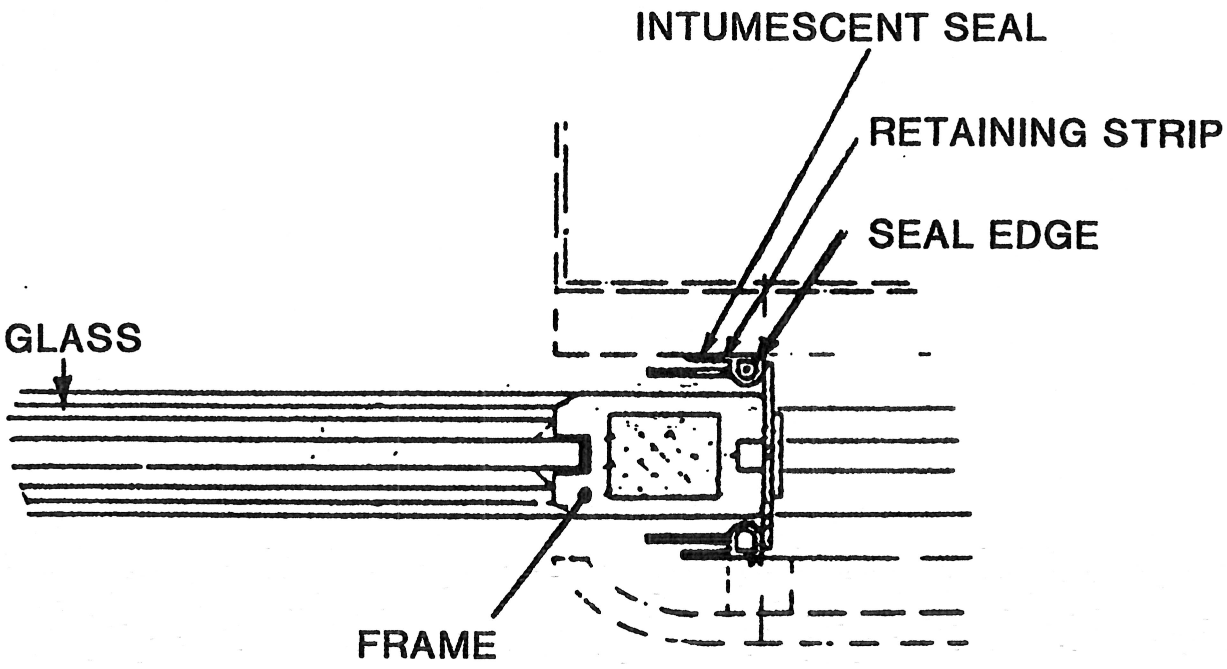
The window pan trim assembly is the same as for the saloon bodyside windows.

The clear glass window opposite the toilet compartment is mounted in a similar manner.

FIRE BARRIER DOORS

The fire barriers incorporated in the doors are located at the intermediate end and are constructed with an aluminium extruded frame containing 4mm double glazed toughened glass (thermo plus K capafloat) with a pale grey tint. The doors also contain intumescent seals which expand when heated to form a tight seal, thereby preventing any fire from passing into the adjacent vehicle.

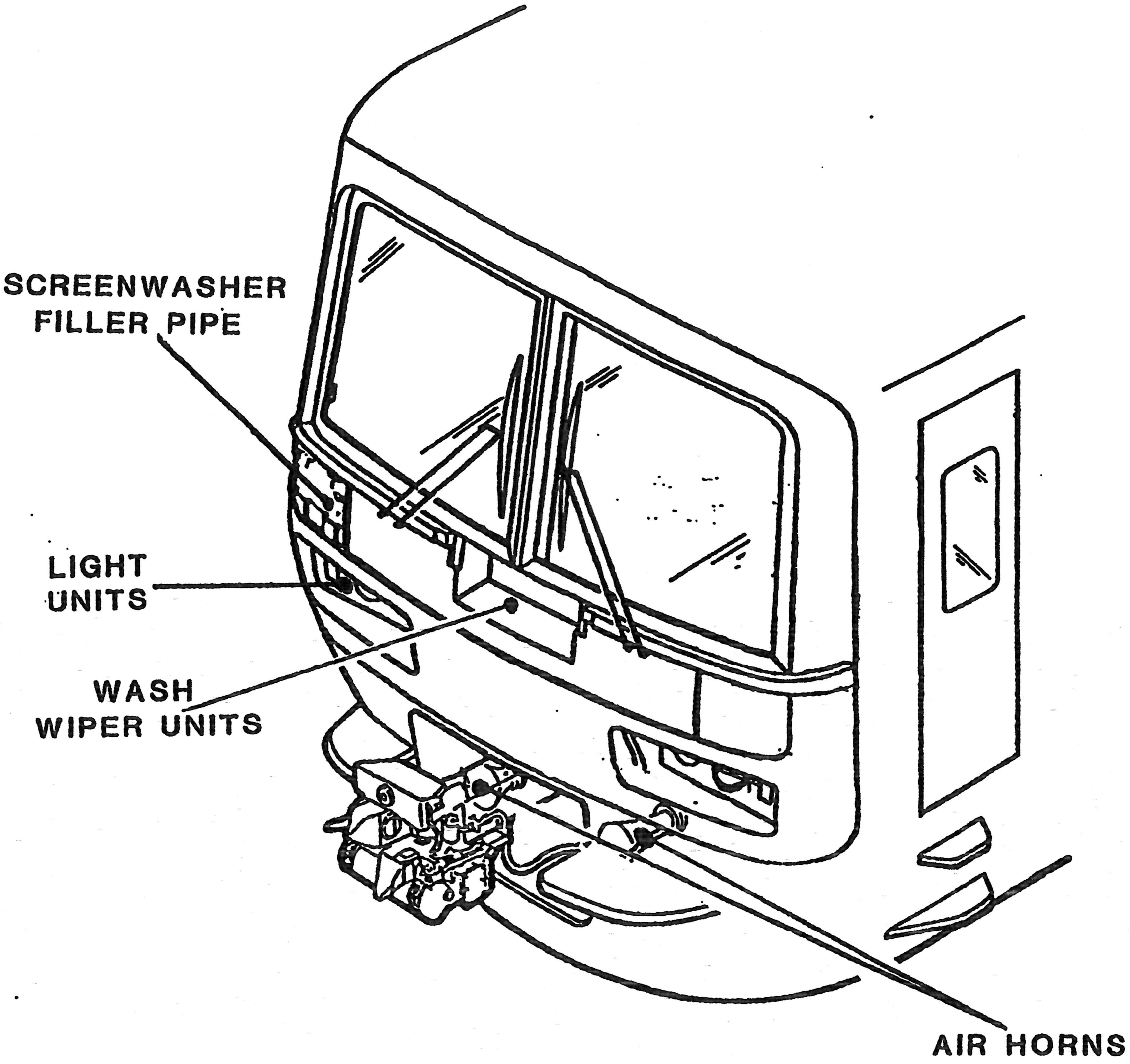
FIRE BARRIER GLASS FIXING ARRANGEMENT


INTUMESCENT SEAL
RETAINING STRIP
SEAL EDGE
GLASS
FRAME

CAB END EQUIPMENT

Outer cab end equipment is made up of the following components:-

- Head, Tail and Marker Light units
- Air Horns
- Wash/Wiper units

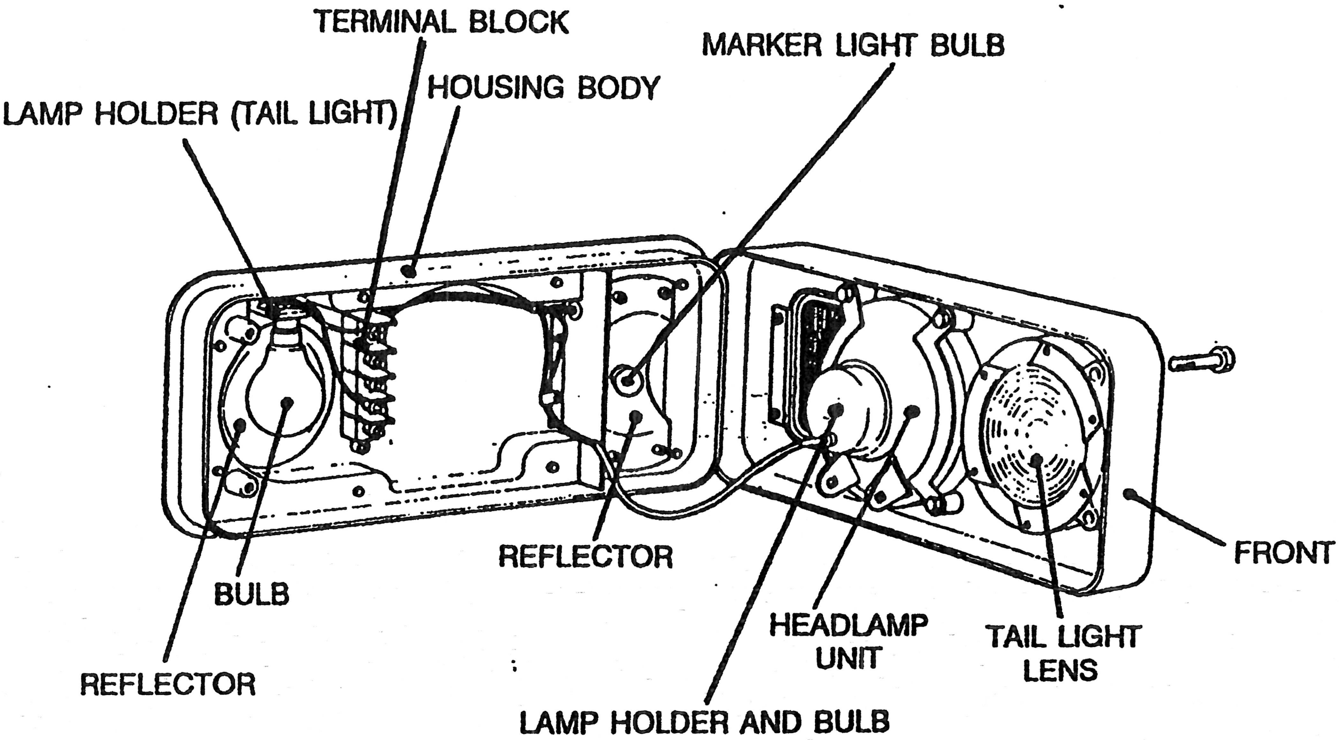

SCREENWASHER FILLER PIPE
LIGHT UNITS
WASH WIPER UNITS
AIR HORNS

HEAD, TAIL AND MARKER LIGHT UNITS

Two light units are provided at the cab end of each vehicle. These units incorporate head light, tail light and marker light unit in a single housing. The housing consists of a cast alloy body fitted with a polycarbonate lens. The body is fitted with the head lamp unit lampholders, reflectors and terminal blocks.

For easy maintenance each unit is hinged on one side. Removal of two screw allows the front cover to swing outwards for full access to the bulbs, holders and wiring etc.

LEFT-HAND HEAD/MARKER/TAIL LIGHT UNIT


TERMINAL BLOCK
MARKER LIGHT BULB
HOUSING BODY
LAMP HOLDER (TAIL LIGHT)
REFLECTOR
FRONT
BULB
HEADLAMP UNIT
TAIL LIGHT LENS
REFLECTOR
LAMP HOLDER AND BULB

AIR HORNS

The horns, located below the headstock, at the driving end of each vehicles, are controlled by a two-way horn valve situated in the drivers cab.

Two air horns are provided:-

'E' flat - frequency 311 Hz
'G' flat - frequency 370 Hz

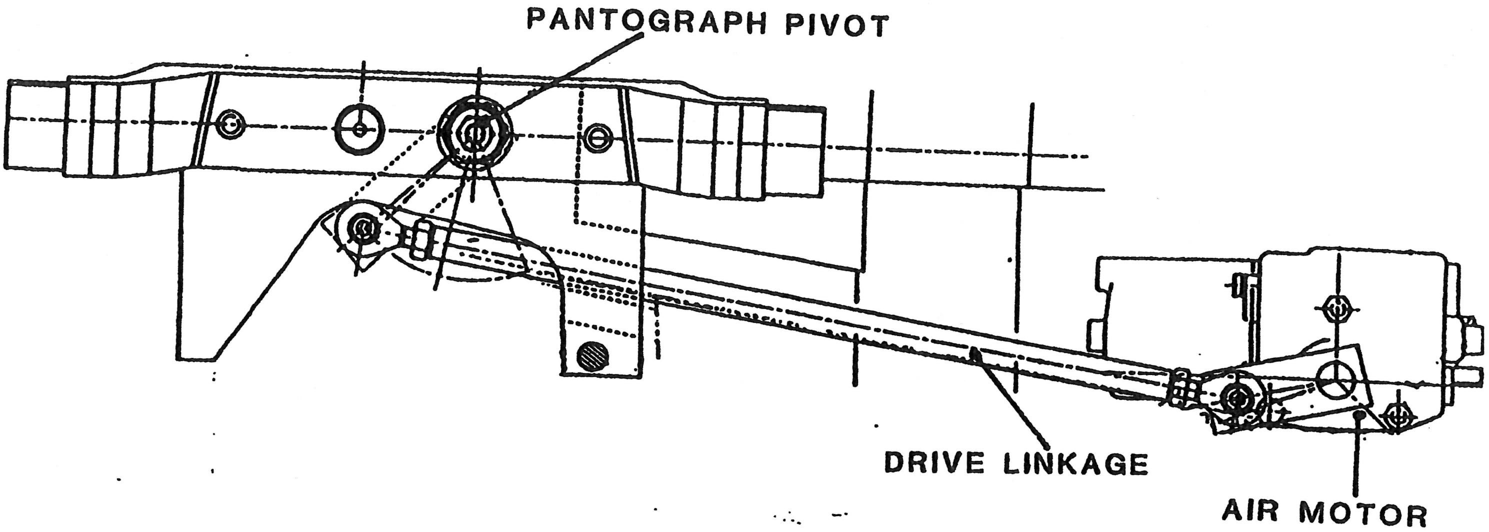
WINDSCREEN WIPER ASSEMBLY

One wiper/wash unit is installed for each windscreen. Both wiper air motors and drive linkages are located in a large pocket below the windscreen. Equipment is accessed by removing the front perspex cover, not from the inside of the cab G.R.P. structure.

The pantograph arrangement ensures that the majority of the windscreen is cleared.

NOTE: Pantographs are not interchangeable from screen to screen.

WINDSCREEN WIPER ASSEMBLY



The windscreen wiper knob on the drivers consul controls the wipe/wash equipment on both windscreens.

The control has three positions:-

P Parked

S Slow Speed

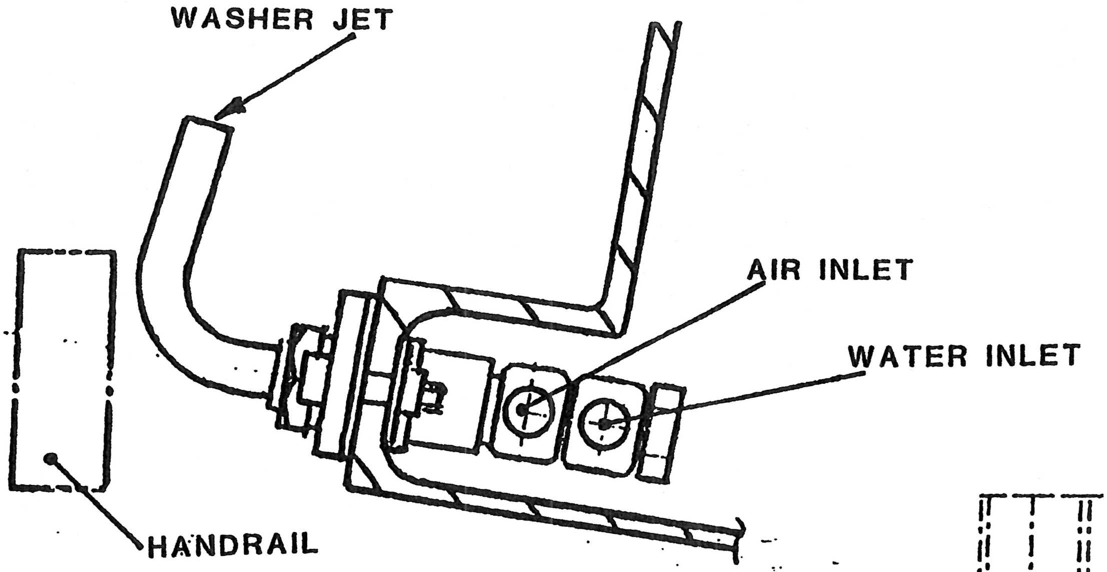
F Fast Speed

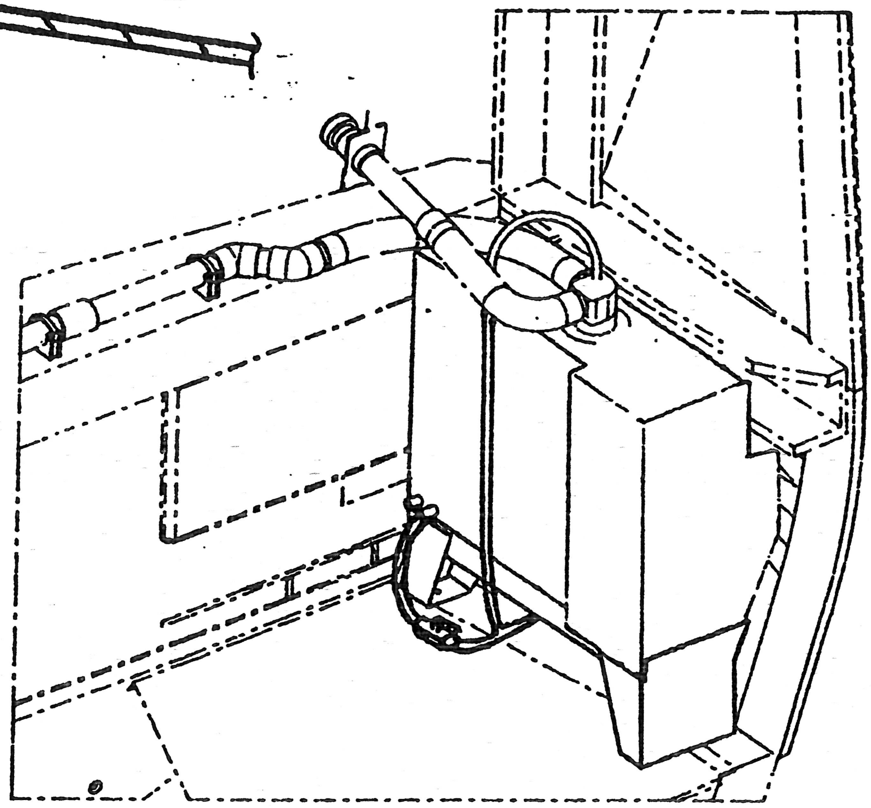
WINDSCREEN WASHER ASSEMBLY

The washer assembly is located with the wiper units. The washers use the venture effect to draw water from the washer bottle installed under the desk non-drivers side.

Two inlet pipes are located behind two hinged covers below the windscreen each side of the vehicle.

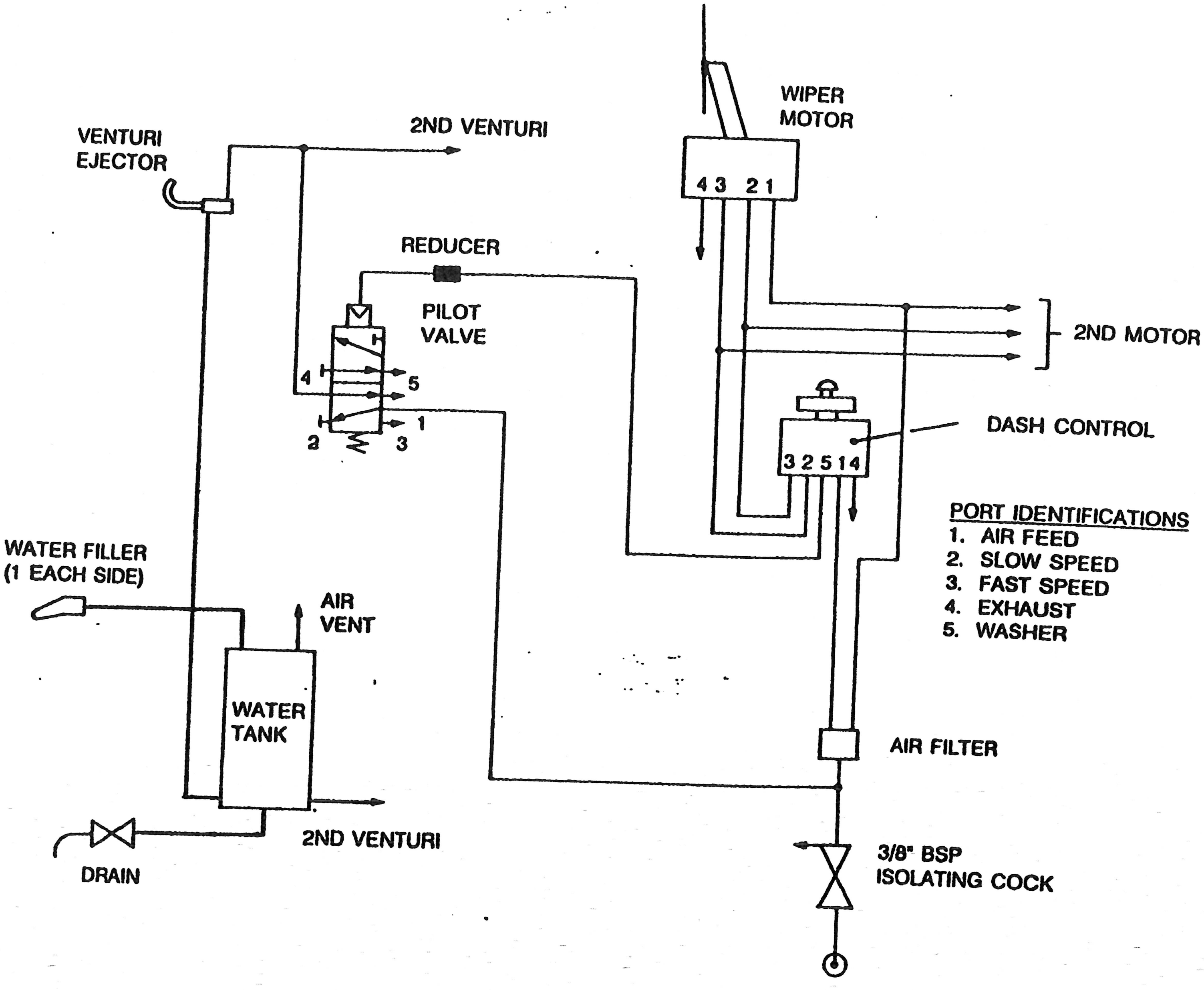
WINDSCREEN WASHER


WASHER JET
AIR INLET
WATER INLET
HANDRAIL



WINDSCREEN WASHER TANK

WINDSCREEN WASHER AND WIPER SCHEMATIC


WIPER MOTOR
4 3 2 1
2ND VENTURI
VENTURI EJECTOR
REDUCER
PILOT VALVE
4
5
1
2
3
2ND MOTOR
DASH CONTROL
3 2 5 1 4
WATER FILLER (1 EACH SIDE)
AIR VENT
WATER TANK
2ND VENTURI
DRAIN
AIR FILTER
3/8" BSP ISOLATING COCK

PORT IDENTIFICATIONS

1. AIR FEED
2. SLOW SPEED
3. FAST SPEED
4. EXHAUST
5. WASHER

COUPLERS

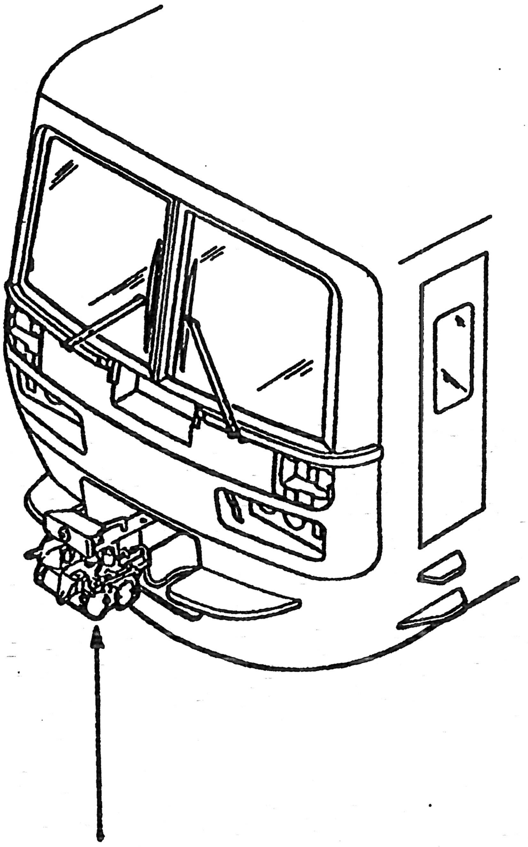
The Class 165 is fitted with two types of B.S.I. coupler.

a) An automatic coupler at each cab end with automatic uncoupler feature and electric connection box.

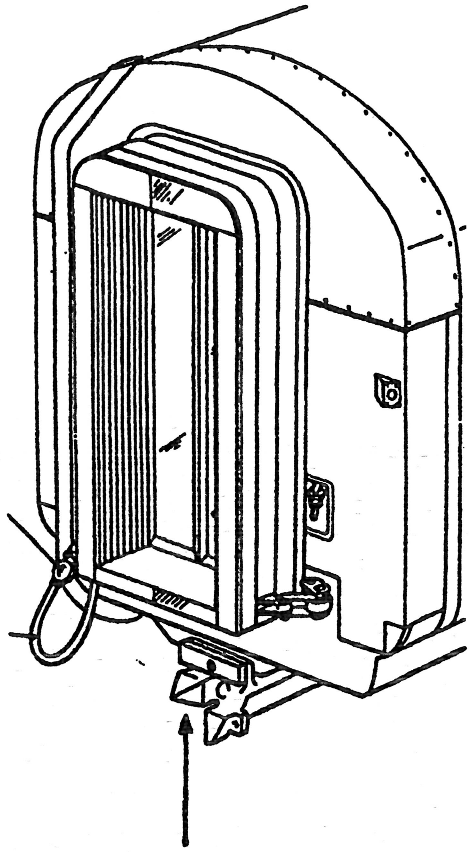
b) A semi-automatic coupler at the intermediate (or non-cab) ends.

The basic B.S.I. mechanical coupler is the same for both ends of the vehicle, but the method of operation and auxiliary equipment is different.

The Class 165 can be coupled to other modern DMMU's mechanically but as the electric circuits are not compatible the auto-coupler electrical connection box MUST be retracted.



AUTOMATIC COUPLER



SEMI-AUTOMATIC COUPLER

BASIC COUPLER

DESCRIPTION

The coupler consists of an integrally cast coupler head and drawbar, which is cast from high tensile steel and incorporates guide horns to enable automatic coupling to take place within a pre-defined horizontal and vertical gather range.

Mechanical locking of engaged couplers is achieved by a high tensile steel spring-loaded coupler pin, housed in a sleeve contained in the head casting, behind the horizontal alignment guide horn.

An uncoupling lever attached to the coupler pin provides the facility for manual uncoupling. The coupler pin is lubricated via a grease nipple, access to which is through a hole in the underside of the upper guide horn.

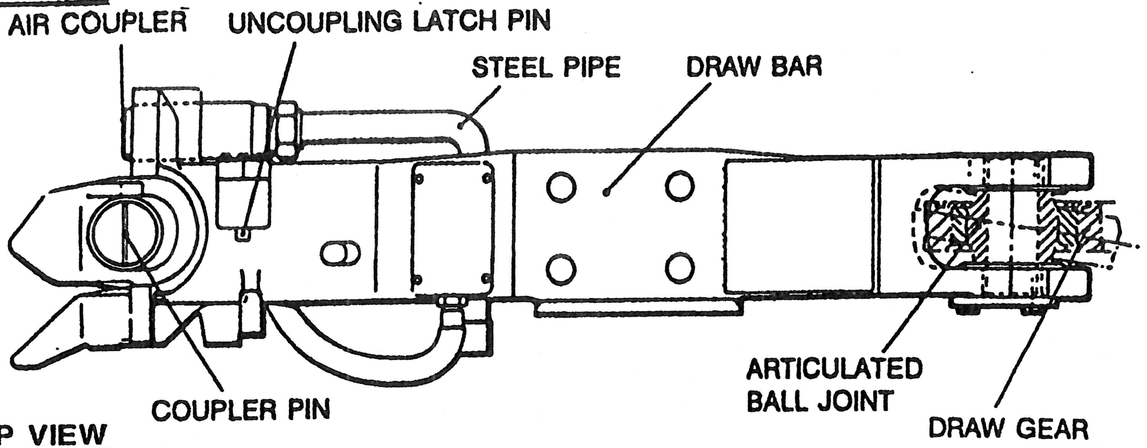
A self-sealing air coupler (MR pipe) is provided centrally in the upper buffing face of the coupler head, and is connected to a steel pipe. This pipe is routed to the right hand side of the skirt where a Schreader (quick release coupling) and isolation cock are fitted. A flexible hose can be fitted for connection to the main reservoir pipe on the underframe.

The coupler is connected to the vehicle underframe via the tail pin and drawgear assembly. A fabricated coupler suspension unit is secured to the headstock by eight bolts. This unit provides front support for the coupler. A wear plate is provided on the top surface of the suspension unit and is renewable.

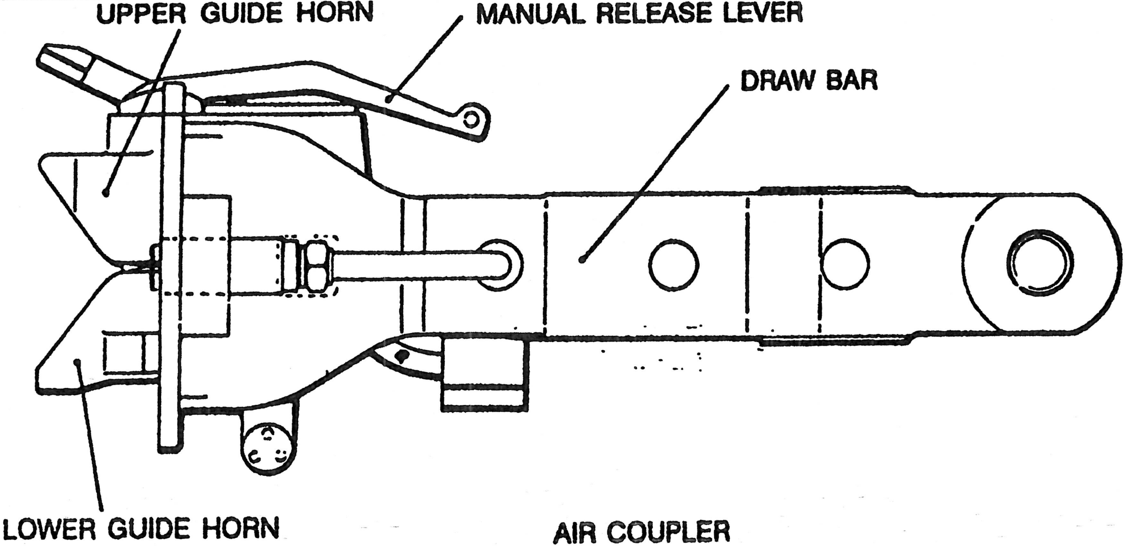
Side to side coupler movement is restricted by rubber side control units secured to the underframe on each side of the coupler drawbar.

BASIC COUPLER

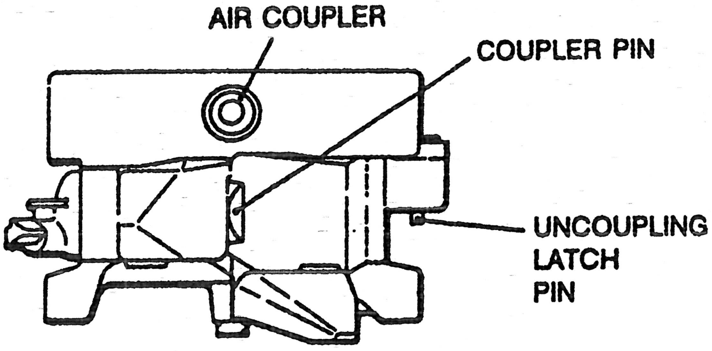
SIDE VIEW


AIR COUPLER
UNCOUPLING LATCH PIN
STEEL PIPE
DRAW BAR
ARTICULATED BALL JOINT
DRAW GEAR
COUPLER PIN

TOP VIEW

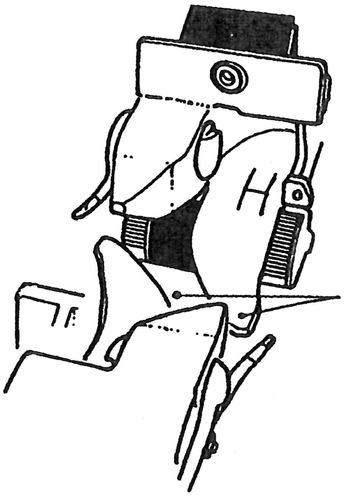

UPPER GUIDE HORN
MANUAL RELEASE LEVER
DRAW BAR
LOWER GUIDE HORN

END VIEW


AIR COUPLER
COUPLER PIN
UNCOUPLING LATCH PIN

COUPLER OPERATION

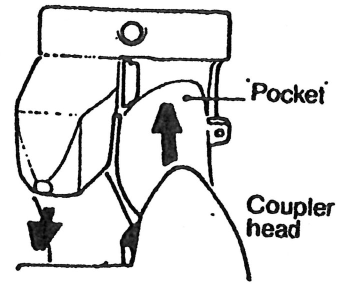
GUIDE HORNS



The gathering horns guide the coupler heads into alignment.

GATHERING

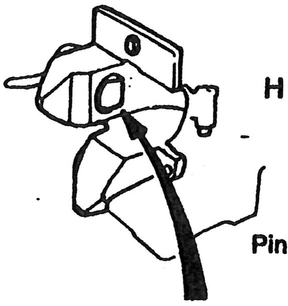
COUPLINGS ABOUT TO ENGAGE



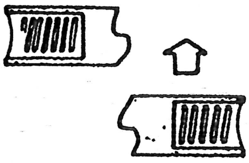
Note how each coupler head fits into a 'pocket'.

COUPLER PINS

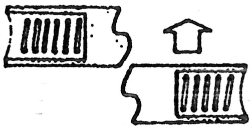
HOW THEY WORK



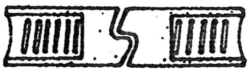
Pins removed for clarity



APPROACHING



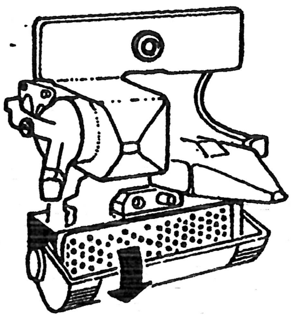
ABOUT TO ENGAGE



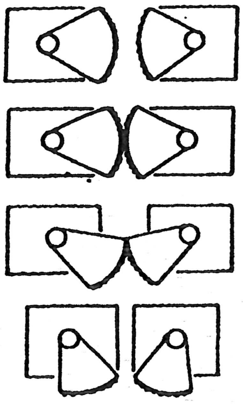
ENGAGED

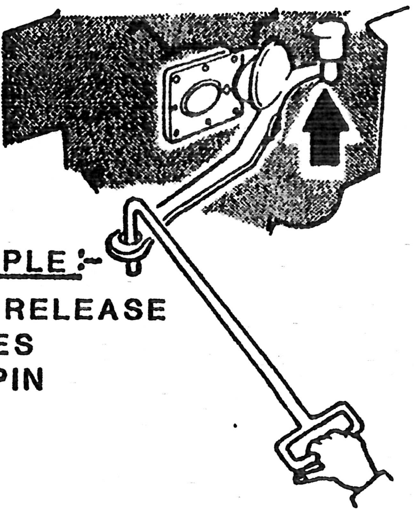
ELECTRICAL CONNECTION BLOCK

(AUTOMATIC COUPLER ONLY)



Cover 'rolls' open when coupling up - see right.





TO UNCOUPLE:-

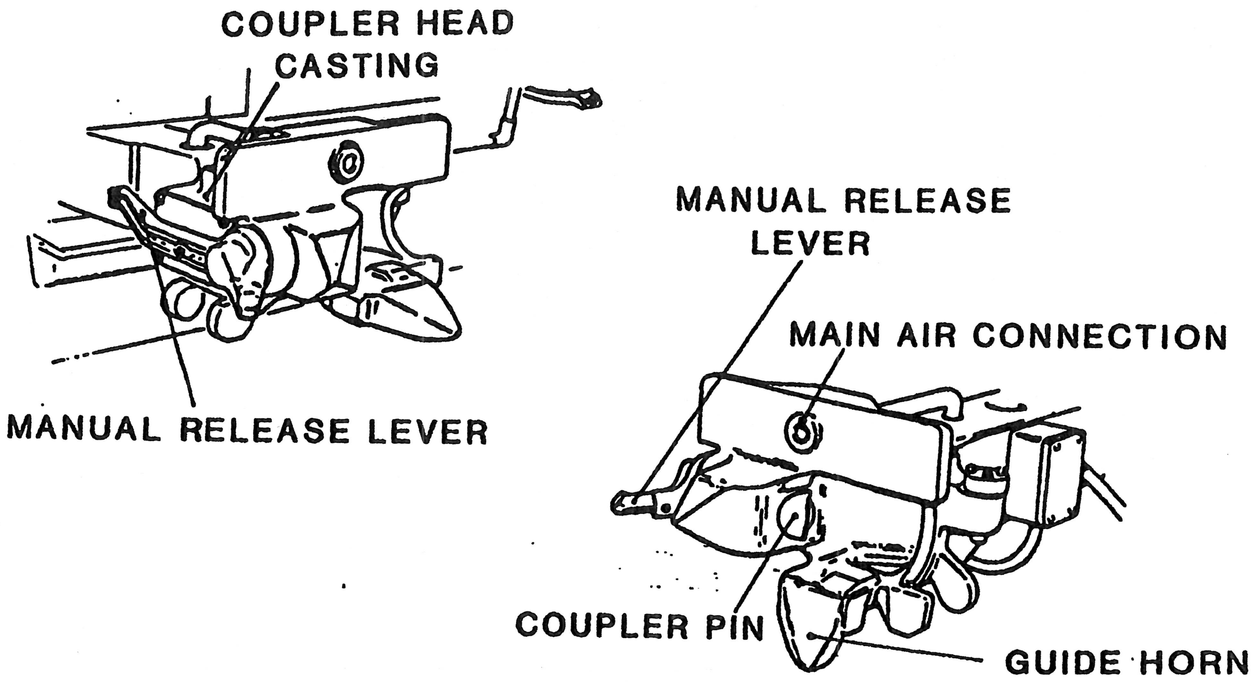
PULL UNTIL MANUAL RELEASE
LEVER ENGAGES
BEHIND LATCH PIN

SEMI-AUTOMATIC COUPLER

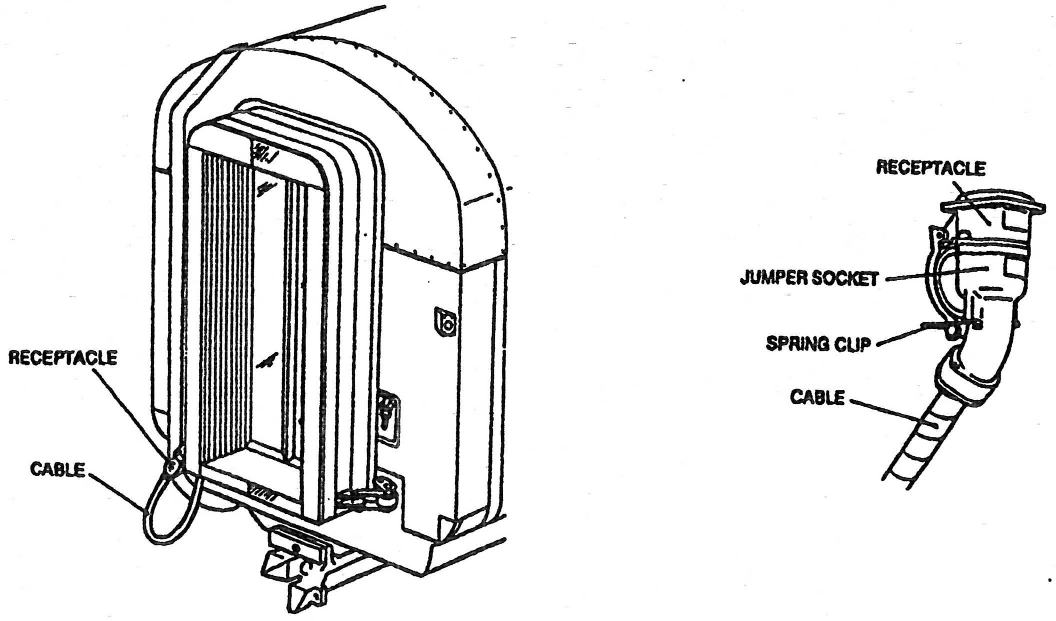
(Non-cab End)

The coupler situated at the trailing end of the vehicle is semi-automatic in operation and provides automatic coupling of vehicles mechanically and pneumatically. Uncoupling can only be achieved manually using one of the uncoupling levers. Electrical connections are achieved using a separate 42 way jumper cable between vehicles.

SEMI-AUTOMATIC COUPLER


COUPLER HEAD CASTING
MANUAL RELEASE LEVER
MANUAL RELEASE LEVER
MAIN AIR CONNECTION
COUPLER PIN
GUIDE HORN

INTERMEDIATE (NON-CAB) END ELECTRICAL COUPLING


RECEPTACLE
CABLE
RECEPTACLE
JUMPER SOCKET
SPRING CLIP
CABLE

AUTOMATIC COUPLER

(Cab End)

The automatic coupler at the cab end couples vehicles together mechanically and also connects the main reservoir (MR) pipe and electrical control wires.

An air cylinder controlling the movement of the uncoupling lever is provided so that uncoupling can take place by remote control from within the vehicle. Movement of the lever also controls the operation of a snap action micro-switch.

An electric connection box provides electric connection between adjacent vehicles when mechanically coupled. This connection box is carried below the mechanical coupler head on a movable frame and is held in the forward position by two stacks of disc springs, this whole assembly sliding on two guide rails. During coupling the profiled front covers make contact and automatically rotate open, permitting the electric contacts to come together.

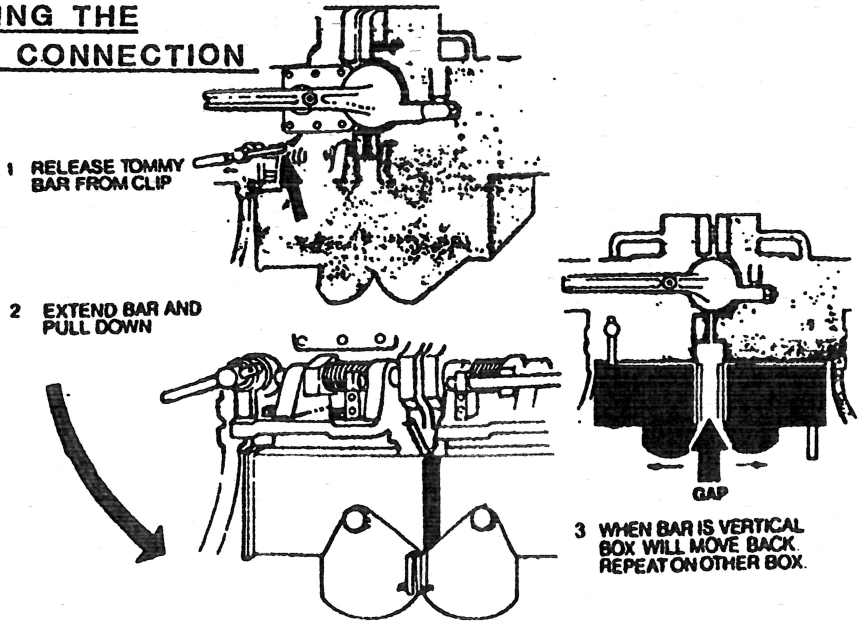
Each electric connection box contains 103 individual contacts, (53 spring loaded, 50 fixed), providing 53 separate circuits. Each contact is continuously rated at 110 volts, 30 amp. A rubber seal around the contact insulation block protects against ingress of water and other contaminants in both the coupled and uncoupled mode.

Lugs cast on the underside of the coupler head provide mounting for the electric connection box guide rails. The electric connection box is spring-loaded on these guide rails and special tools to operate the levers are provided to enable retraction of the electric connection box to be made independently from the automatic coupler if required.

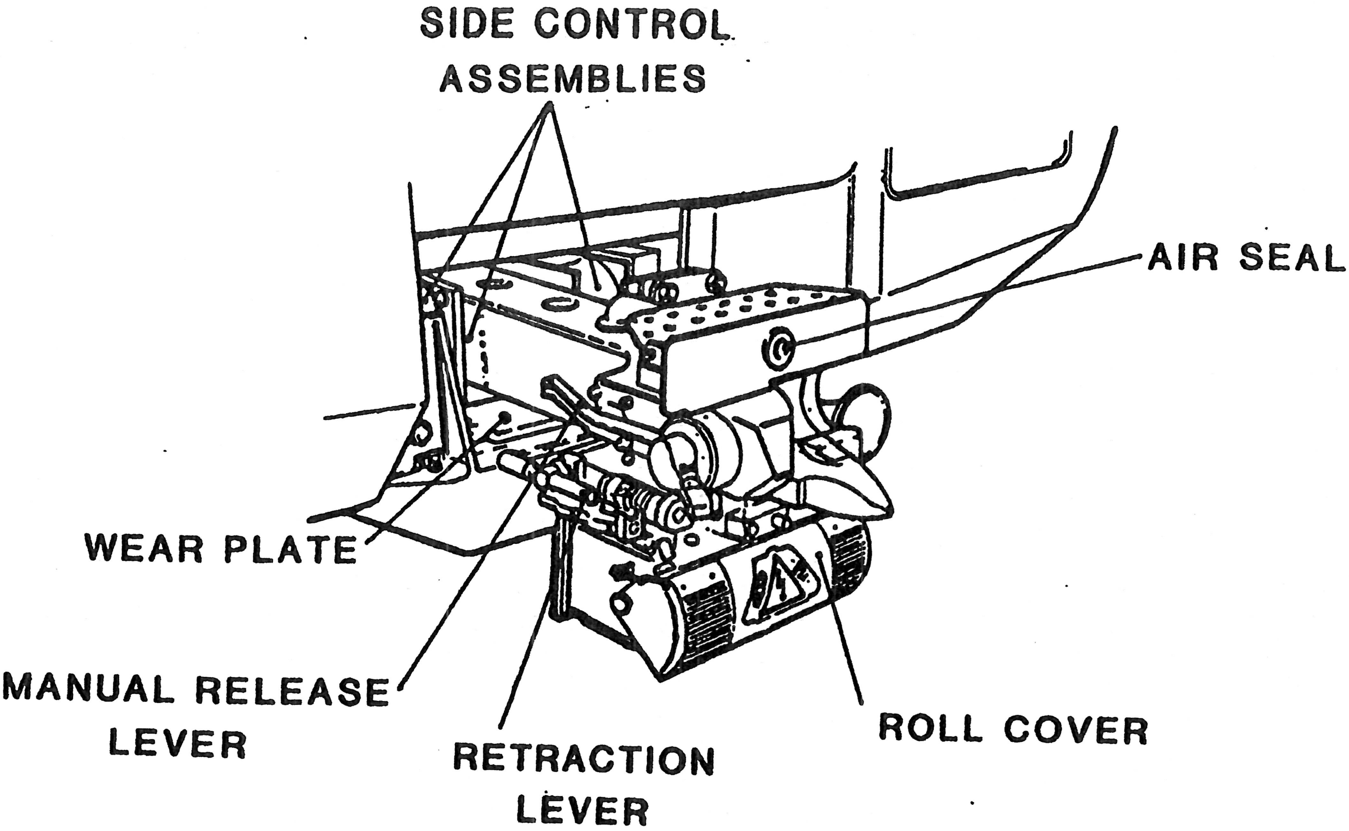
To ensure complete isolation it is necessary to retract both electrical connection boxes of adjacent vehicles.

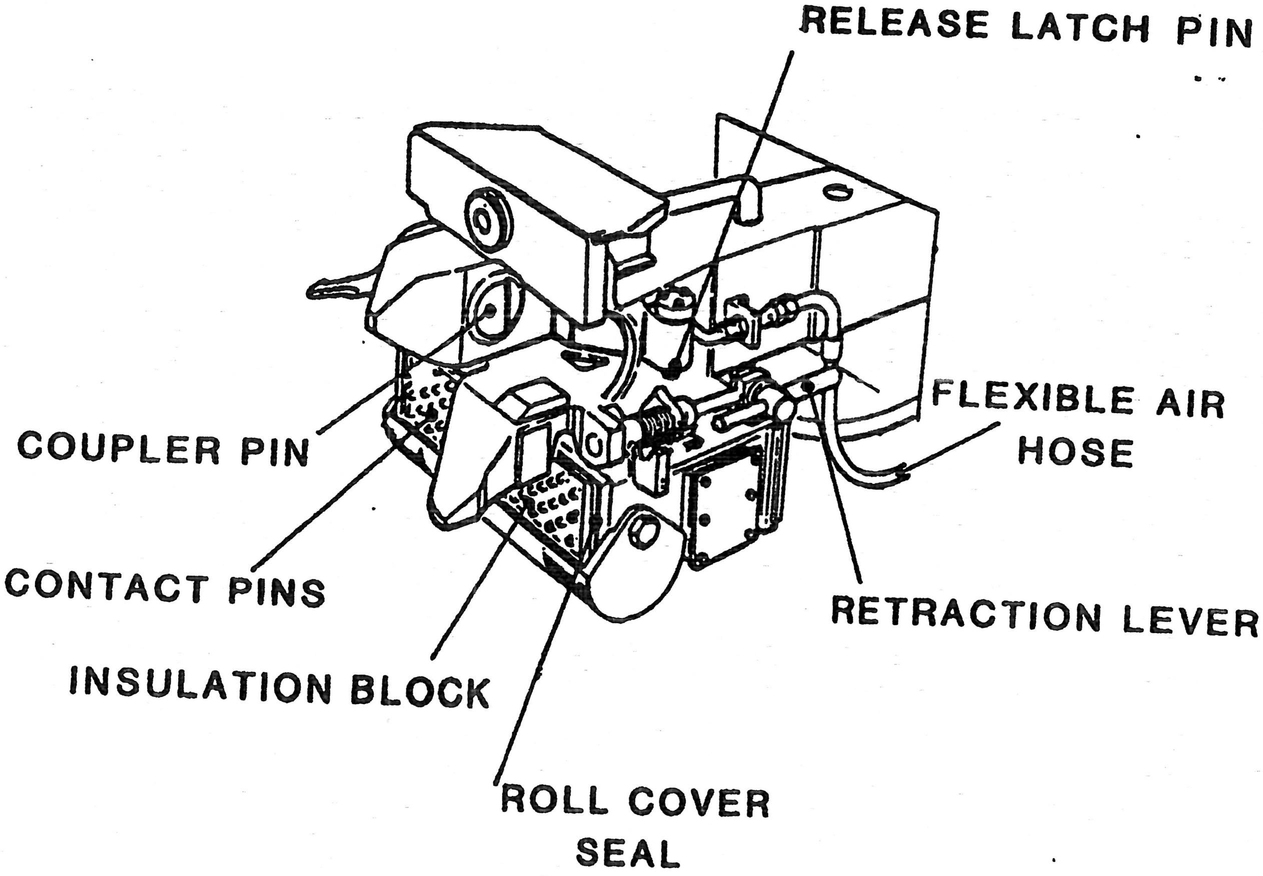
Multi-core cable is led into the rear of the electric connection box through cable glands provided in the rear cover. Each individual cable is connected to its contact by a push-on connector. Damaged contact tips can be renewed from the front of the electric connection box without disturbing the wiring, for this purpose each contact is provided with removal slots.

RETRACTING THE ELECTRIC CONNECTION BOXES


1 RELEASE TOMMY BAR FROM CLIP
2 EXTEND BAR AND PULL DOWN
GAP
3 WHEN BAR IS VERTICAL BOX WILL MOVE BACK. REPEAT ON OTHER BOX.

AUTOMATIC COUPLER


SIDE CONTROL ASSEMBLIES
AIR SEAL
WEAR PLATE
MANUAL RELEASE LEVER
RETRACTION LEVER
ROLL COVER


RELEASE LATCH PIN
COUPLER PIN
FLEXIBLE AIR HOSE
CONTACT PINS
RETRACTION LEVER
INSULATION BLOCK
ROLL COVER SEAL

AUTOMATIC COUPLER

OPERATION

The automatic coupler situated at the cab end of the vehicle is fully automatic in operation, allowing Class 165 vehicles to be coupled together to make-up trains without manual intervention.

Supervision and assistance may be required when coupling on tight reverse curves or at the transition point from straight to curved track.

NOTE: Automatic coupler operation can only be achieved from driving cabs where coupling or uncoupling of units is required.

The operation of the automatic coupler and its associated control circuits is controlled by coupler and uncoupler buttons.

These are located on the centre consul of the drivers cab and are covered with flaps to prevent accidental operation.

The coupler control circuits are designed so that coupling and uncoupling can only be achieved when the direction switch is in neutral (N) position.

After coupling two units together the train does not become operational until the 'couple' button is pressed. This will energise a couple relay 'set' coil latching the relay and energising all other coupler relays in both driving cabs.

Couple relay contacts join through train wires interlocking safety and control circuits.

When uncoupling units an uncouple button is pressed. This will energise the latched 'trip' coil of the coupler relay in adjoining driving cabs which also de-energises all other couple relays indentifying the ends of both units electrically.

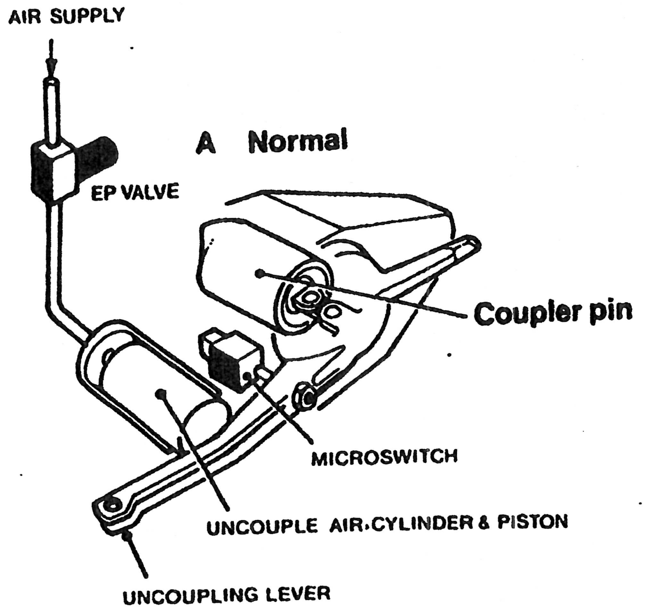
Operation of the uncouple button also energises E.P. valves. The E.P. valves allows air to actuators located in the coupler heads which push the uncoupling levers outwards retracting the coupler pins.

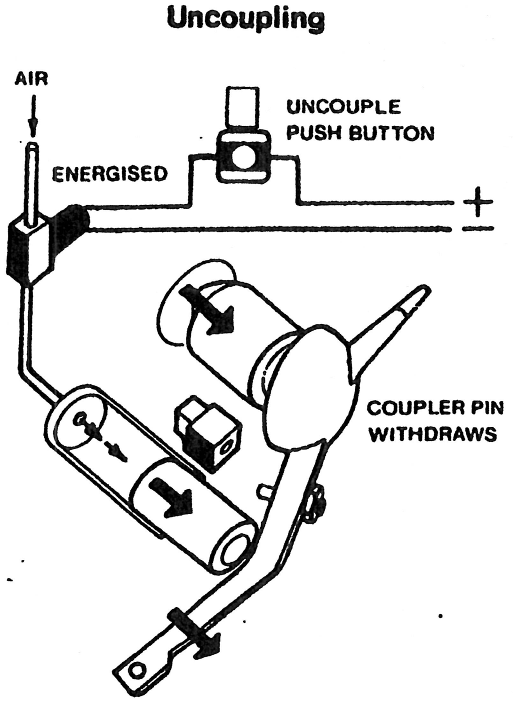
The uncoupling lever will remain outwards, held in that position by the latching pin of the opposing coupler. When this is achieved the push button can be released and the units can then be separated.

As the coupler separates, the covers of the electrical connection box will close automatically and the self-sealing air couplers will close under the action of their springs.

The automatic coupler can be uncoupled by hand using the manual uncoupling lever located on the left hand side of the coupler, when viewed from the front. Before the vehicle can be operated the uncouple pushbutton must be operated so that a backend feed can be supplied to the control circuits for end of train detection. The uncouple pushbutton should be operated before manual uncoupling to ensure that the brakes are fully applied on the portion of the train without a driver. This will ensure that the vehicle with no driver does not "follow" the driven vehicle and will avoid damage to the electrical contacts due to breaking excessive loads.

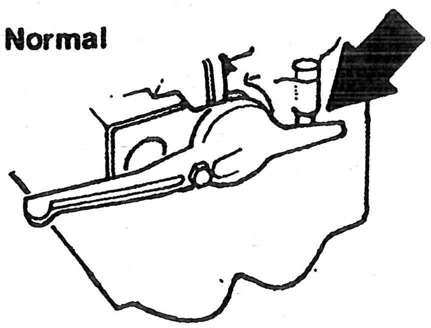
AUTO COUPLER OPERATION

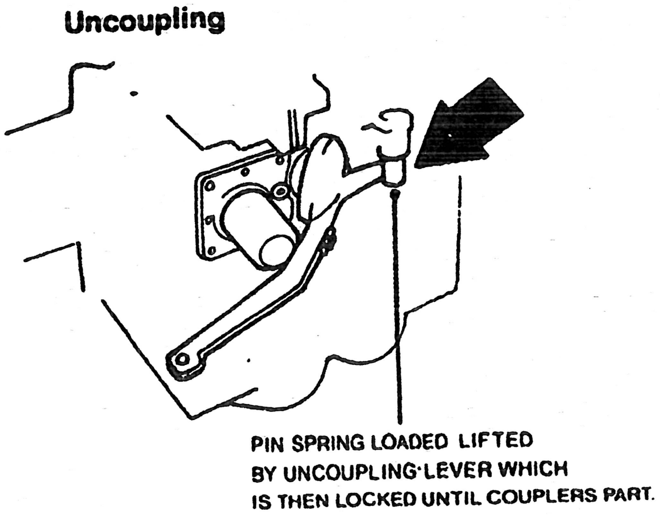

AIR SUPPLY
A Normal
EP VALVE
Coupler pin
MICROSWITCH
UNCOUPLE AIR CYLINDER & PISTON
UNCOUPLING LEVER


Uncoupling
AIR
UNCOUPLE
PUSH BUTTON
ENERGISED
+
−
COUPLER PIN
WITHDRAWS

Uncouple Latch Pin

The spring-loaded uncouple latch pin is lifted when the uncoupling lever is operated. The pin then drops down to lock the lever in the uncoupled position until the couplers part.




Uncoupling
PIN SPRING LOADED LIFTED
BY UNCOUPLING LEVER WHICH
IS THEN LOCKED UNTIL COUPLERS PART.

EMERGENCY COUPLER

An emergency coupler is available to enable the unit to be coupled to a locomotive or a Class 253/254 High Speed Train (HST). The drawbar is necessary due to the absence of buffers on the DMU. The emergency coupler is not carried on 165 type vehicles.

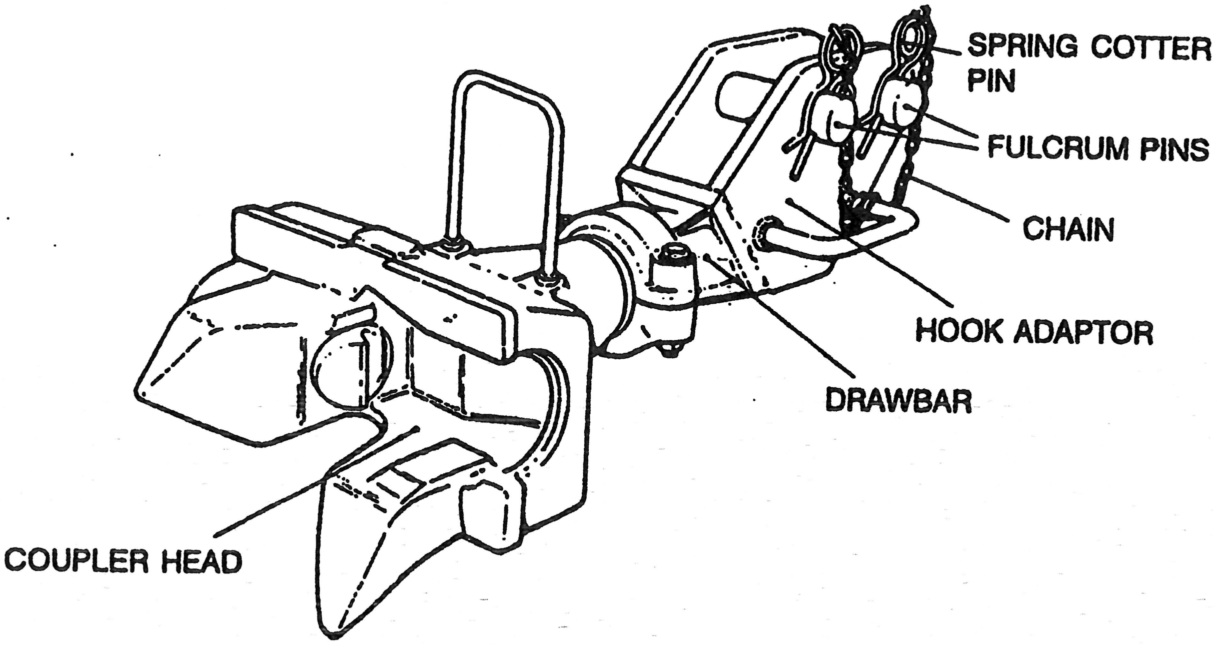
There are alternative types of emergency couplers:-

1. Emergency coupler - Davies and Metcalfe
2. Emergency coupler - British Rail

Emergency Coupler - Davies and Metcalfe

The emergency coupler manufactured by Davies and Metcalfe consists of a one-piece drawbar, which includes a hook adaptor, and two fulcrum pins retained to the drawbar by chains.

The coupler, which weighs 42 kg, is used to couple the DMU to a locomotive only.



An emergency air coupling hose is then fitted between the DMU and the locomotive main reservoir pipe.

NOTE: Should air not be available to release the spring applied brakes on the DMU, the brakes can be released manually.

WARNING

A maximum of two class 165/0 DMUs (four vehicles) can be hauled or propelled using the emergency coupler. The emergency coupler cannot be used with the drophead buckeye couplers.

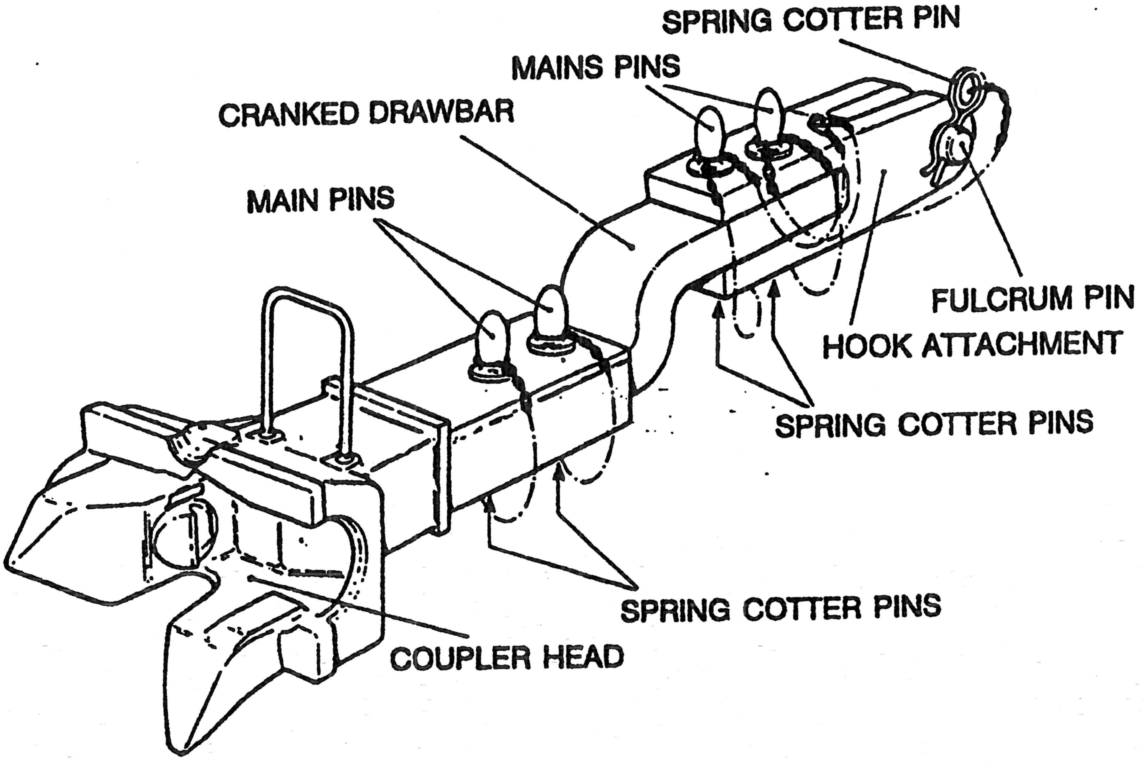
Emergency Coupler - British Rail

The emergency coupler designed by British Rail consists of a three-piece set:-

1. Coupler assembly
2. Cranked drawbar
3. Hook attachment

Four main pins with retaining chains are provided to secure the assembly together, spring cotter pins prevent the main pins from disengaging during towing applications.

The coupler is used to couple the DMU to a locomotive. If necessary the DMU can be coupled to a Class 253/254 HST by using the coupler head assembly and the drawbar provided with the HST.


SPRING COTTER PIN
MAINS PINS
CRANKED DRAWBAR
MAIN PINS
FULCRUM PIN
HOOK ATTACHMENT
SPRING COTTER PINS
SPRING COTTER PINS
COUPLER HEAD

An emergency air coupling hose is then fitted between the DMU and the locomotive main reservoir.

NOTE: Should air not be available to release the spring applied brakes on the DMU, the brakes can be release manually.

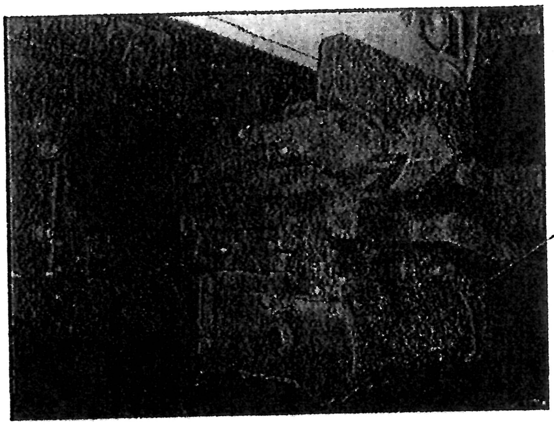
If the locomotive has a fixed drawhook (Class 08) remove the smaller diameter pin from the hook adaptor before moving off.

WARNING

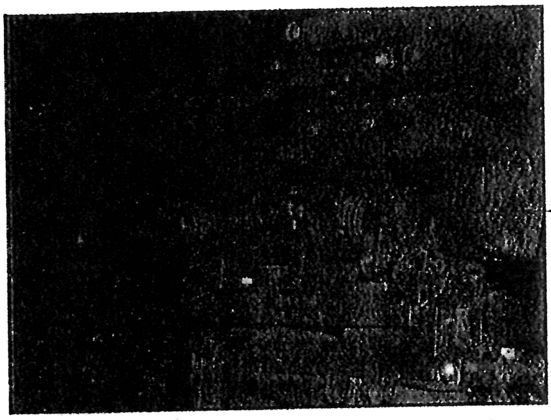
A maximum of four vehicles can be hauled or propelled using the emergency coupler. The emergency coupler cannot be used with drophead buckeye couplers.

ELECTRICAL BOX RETRACTION AND REINSTATE PROCEDURE

Retracting the Electrical Box

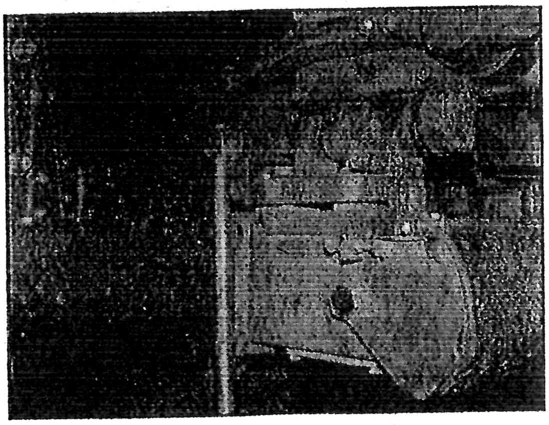


Coupler electrical box in the normal position



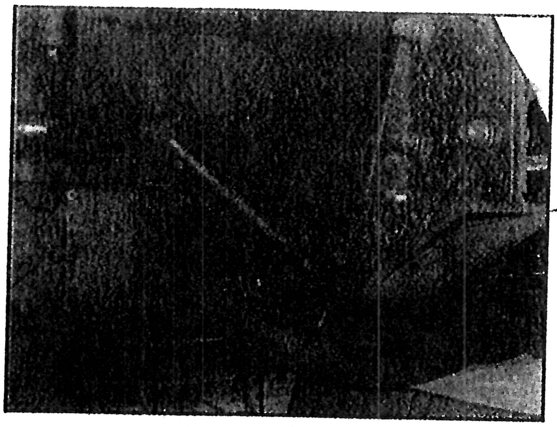
Release the electrical box arms from the rubber holders

Pull down on the retraction arms, being careful not to trap your fingers between the arms and the support beam

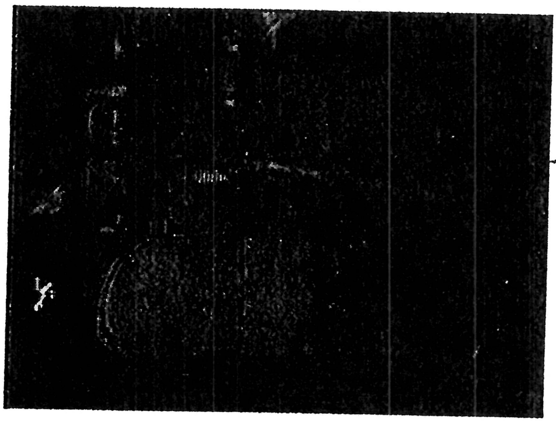


Retract until fully down and locked in position

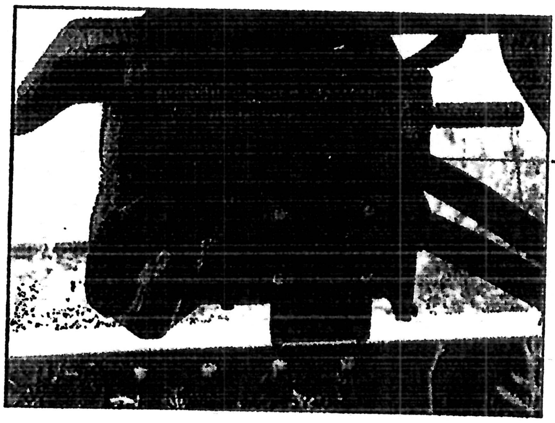
Reinstating the Electrical Box



Push upwards on the retraction arms, again taking care not to trap your fingers, as the box will return under spring pressure



Return the retraction arm to the horizontal position



Refit the retraction arm into the rubber holder